National Patterns of R&D Resources: 1994

An SRS Special Report

Division of Science Resources Studies
Directorate for Social, Behavioral and Economic Sciences

National Science Foundation

NSF 95-304

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An SRS Special Report

John E. Jankowski, Jr., and John R. Gawalt

Division of Science Resources Studies
Directorate for Social, Behavioral and Economic Sciences

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Note

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Contributors

Data tabulations and analyses were performed by John E. Jankowski, Jr., and John R. Gawalt of the Division of Science Resources Studies.

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FOREWORD

In monitoring the resources used in U.S. science and technology, the National Science Foundation assembles and analyzes information about the money and people devoted to research and development and compares that performance with the efforts under way around the globe. Since 1956 we have been issuing reports that summarize national trends. These reports complement the National Science Board's *Science & Engineering Indicators* volumes, which have been published biennially since 1972, and provide an overview of material presented in several other reports issued by the Division of Science Resources Studies.

Kenneth M. Brown,
Director, Division of Science Resources Studies
Directorate for Social, Behavioral and Economic Sciences

March 1995

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Many other SRS staff members provided data for inclusion in this report and reviewed the material for accuracy and currency. Particular appreciation is given to Jennifer R. Gray for her assistance in assembling data for many of the document's charts and tables. Guidance and review were provided by Kenneth M. Brown, Director, SRS.

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ABBREVIATIONS

BEA	Budget Enforcement Act
DOD	Department of Defense
DOE	Department of Energy
FFRDC	Federally Funded Research and Development Center
FTE	full-time equivalent
FY	fiscal year
GDP	gross domestic product
GSP	gross state product
HHS	Department of Health and Human Services
NASA	National Aeronautics and Space Administration
NSF	National Science Foundation
R&D	research and development
S&Es	scientists and engineers

GENERAL NOTES

The National Science Foundation (NSF) sponsors a series of surveys to collect information on the financial and human resources devoted to research and development (R&D). In this report such NSF survey data on the various sectors of the U.S. economy—industry, Government, academia, and selected nonprofit organizations—are aggregated so that the components of the overall R&D effort are placed in a national context. Information presented in *National Patterns* includes the following:

- the level of R&D expenditures;
- the sources of such funds;
- the sector or organization performing the R&D;
- the character of work undertaken (i.e., whether it is basic research, applied research, or development);
- the States in which R&D is undertaken in the United States;
- the number of scientists and engineers employed in R&D; and
- international comparisons with the U.S. effort.

The national totals reported here incorporate data available from the several Division of Science Resources Studies (SRS) surveys as of March 1, 1995, as well as projections to cover the entire year 1994.

These notes provide a brief introduction to the concepts used in the report. Important changes and revisions from previous *National Patterns* reports also are highlighted. For complete definitions, descriptions of projection methodologies, and references to the underlying survey reports, see appendix A.

PERFORMER REPORTING BASIS

SRS annually surveys Federal Government agencies, industry, and academia. Respondents in each sector indicate the amounts they spend on R&D in their own sector and the sources of these funds. National historical totals are based on data reported by performers because they are in the best position to (1) indicate how much they spent in the actual conduct of R&D in a given year, (2) classify their R&D by character of work, and (3) identify the sector of the economy in which their financing originated. The consistent use of performer reporting reduces the possibility of double-counting and conforms to international standards and guidance.

There are exceptions to the use of performer-reported data. The last complete survey of the nonprofit sector was conducted in 1973. Although informal surveys of this sector have been undertaken periodically, estimates of the R&D performance by nonprofit organizations reported here are based generally on (1) Federal agency reporting of Federal funding to the nonprofit sector and (2) R&D performance trends in the other non-Federal sectors.

NSF conducts only occasional surveys of State government agencies; the last two surveys covered fiscal years (FYs) 1977, 1987, and 1988. Consequently, the national R&D time-series totals exclude estimates of State agencies' intramural R&D performance. State funds for R&D reported by other sectors of the economy, however, are included in the respective R&D performance totals.

One byproduct of the decision to use performer-reported data is that the federally funded R&D performance totals presented in *National Patterns* differ from the Federal R&D funding totals reported by the Federal agencies that provide the funds. A major reason for these differences is that performers of R&D often expend Federal funds in a year other than the one in which the Federal Government provides authorization, obligations, or outlays (all defined in appendix A).

PROJECTIONS

Although respondents continually are given the opportunity to revise prior data, R&D totals for 1992 reported here are considered to be actual expenditures. Estimates for 1993 generally may be considered "preliminary"; reported 1994 R&D totals are projections.

To the greatest extent possible, this report incorporates data for 1994 R&D programs contained in the administration's 1995 budget proposal. Where these data are used, it is explicitly noted in the text. The budget, however, does not contain estimates on the detailed disaggregation reported in *National Patterns*; most importantly, it includes very little information on the economic sectors receiving the Federal funds. Consequently, Federal agencies' R&D performance for 1993 and 1994 are derived from an NSF survey coinciding with the third quarter of FY 1994; therefore the amounts reported for 1994 reflect congressional appropriations, apportionment, and reprogramming decisions as of that time.

Industry R&D performance for 1994 is derived from 158 company responses to an August 1993 mail survey of the Industrial Research Institute's (IRI's) membership. The IRI, which annually conducts this survey, is an association of approximately 260 R&D-performing companies with annual R&D expenditures ranging from around $1 million to over $6 billion.

R&D performance estimates for 1994 for the other sectors of the economy are derived from regression and time-series modeling techniques. Inputs to these models are (1) the performer-reported actual R&D performance data and (2) information on Federal R&D funding of non-Federal sectors, as reported by Federal agencies in the third quarter of FY 1994.

REVISIONS TO INDUSTRY R&D DATA

The U.S. Bureau of the Census annually undertakes a survey of industrial R&D performers for the National Science Foundation. This *National Patterns* is the first to include revised R&D data based on a new industry sample drawn for the 1992 survey year; data for 1991 were also collected. Prior to the 1992 survey, data were based on probability samples selected about every 5 years. In the intervening years a panel of the largest firms known to perform R&D was surveyed. For the 1987 survey about 14,000 firms were selected for the sample. For the 1988 through 1991 studies, approximately 1,700 of these firms were annually resurveyed; the other firms did not receive another questionnaire, and their R&D data were estimated. Beginning with the 1992 survey, NSF will draw new samples annually, and the sample size is increased to 23,000 firms. Industry classifications also were updated. The new sample now better reflects the widening population of R&D performers among firms in nonmanufacturing industries and small firms in all industries. As a result of these survey improvements, the revised 1991 industry R&D performance total is 14 percent higher than was previously reported; the national R&D total is 10 percent higher.

Additionally, and as reported in the previous *National Patterns*, the methodology used by the U.S. Bureau of the Census for imputing character-of-work splits for industry's R&D performance was changed for 1986 and later years. These data are not strictly comparable with data for 1985 and earlier years. See appendix A for further discussion of the industry survey changes.

REVISIONS TO R&D PERSONNEL DATA

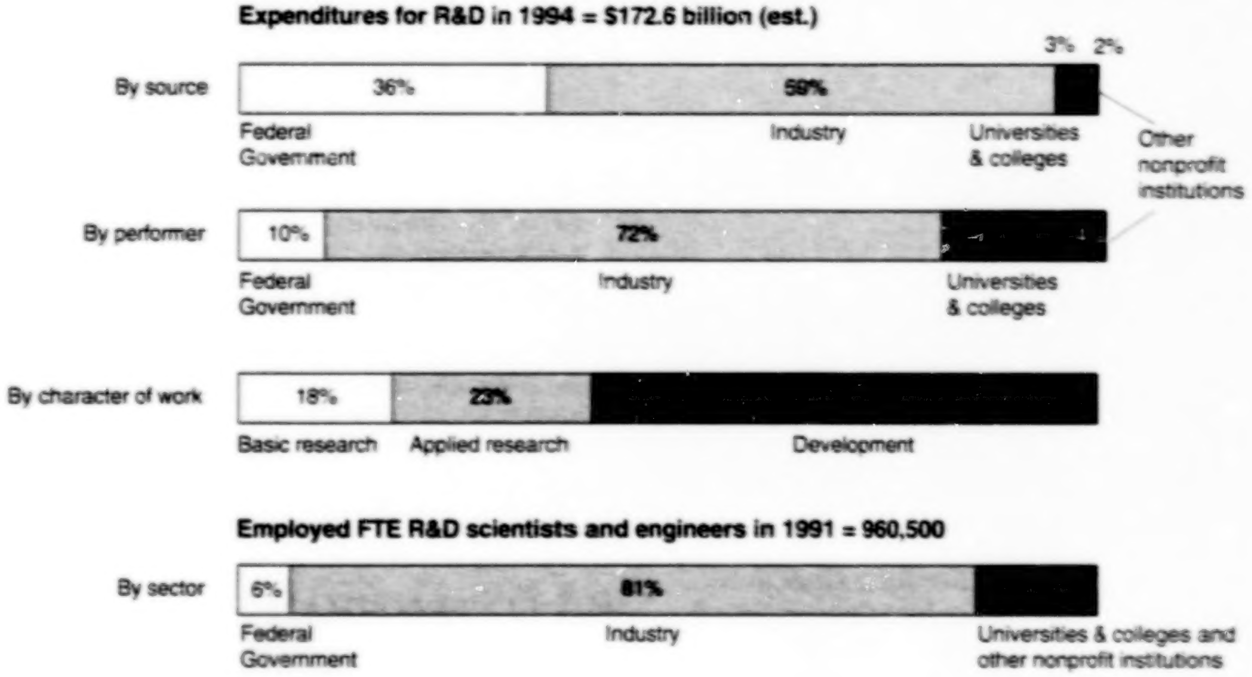
This *National Patterns* is the first to include revised data on scientists and engineers (S&Es) engaged in R&D activities. This national series consists of separate survey estimates of R&D S&Es employed in industry and in the Federal Government and doctorate-holding R&D S&Es employed in educational institutions and in nonprofit organizations. The industry series are for S&Es employed on a full-time-equivalent basis; totals for the other sectors reflect the primary work activity of S&Es. See appendix A for discussion of the strengths and limitations of these series and comparison with the personnel series previously published in the *National Patterns*.

HIGHLIGHTS

R&D EXPENDITURES

- Total R&D expenditures in the United States are estimated to have reached $173 billion in 1994, or about 2 percent more than the estimated $170 billion spent in 1993. In inflation adjusted terms, total R&D expenditures were virtually unchanged between 1993 and 1994. This is consistent with the trend in recent years of an overall slowing in R&D expenditures.
- Industry is estimated to have provided $102 billion in 1994, representing a 2-percent increase over 1993 spending but is unchanged in real terms. Federal R&D support is estimated at $62 billion (chart 1), which would be a 1-percent increase—down 1 percent after inflation. Most of the remaining R&D funds came from universities and colleges and the State and local governments supporting them. Their $8 billion in support is 4 percent higher than 1993 levels, or 2 percent, after inflation. (These estimates are based on performer surveys and modeling techniques outlined in appendix A.)

Chart 1
The national R&D effort



KEY: FTE = full-time equivalent

NOTES: Details may not add to 100 percent because of rounding. R&D funds for federally funded R&D centers are included in their affiliated sectors.

SOURCE: National Science Foundation/SRS

- Growth in total U.S. R&D expenditures has been slow since the mid-1980s. From 1980 to 1985, R&D spending increased on average by 7 percent per year in real terms. Over the 1985–94 period, the average annual rate of real R&D growth is estimated at 1 percent. Both Federal and non-Federal R&D support slackened considerably during this period, and—in some years—even declined.

- From 1980 to 1985, national expenditures on R&D activities grew by 38 percent in real terms and were fueled largely by major increases in Federal support for defense-related R&D programs. Defense R&D grew from 50 percent of the Federal R&D budget authority in 1980 to 68 percent in 1985. The defense share peaked at 69 percent in 1986 before declining fairly steadily to its 56-percent share of the 1994 Federal R&D budget authority (as proposed in the administration's 1995 budget). The largest relative gains in Federal nondefense R&D support since the mid-1980s have been slated for space and health-related activities.[1]

- Because of rigorous constraints placed on all parts of the budget, total Federal R&D support (both defense- and civilian-related) slowed from a 6-percent average annual real rate of increase during 1980–85 to an estimated 1-percent rate of decline for 1985–94.

- Non-Federal support for R&D fell from a 7-percent average annual real rate of increase over 1980–85 to an estimated 3-percent growth rate for the 1985–94 period.

- As a result of recent R&D trends, the proportion of gross domestic product (GDP) spent on R&D activities dropped slightly, from 2.8 percent in 1985 to an estimated 2.6 percent in 1994.

U.S./INTERNATIONAL COMPARISONS

- The United States spends more money on R&D activities than does any other country; in fact, it spends more than Japan, Germany, France, the United Kingdom, and Italy combined. In 1992—the latest year for which foreign data are available—the U.S. spent the same proportion of its GDP on R&D as did Japan (2.8 percent) and its ratio of R&D funds to GDP was slightly greater than unified Germany's (2.5 percent). In comparison, the ratio for France was estimated at 2.4 percent and for Italy, 1.4 percent. The British R&D/GDP ratio was 2.1 percent in 1992.

- The nondefense R&D/GDP ratio for the United States in 1992 (2.1 percent) was considerably lower than those for Germany (2.4 percent) and Japan (2.8 percent). France and the United Kingdom, which have substantial defense R&D efforts, each reported nondefense R&D/GDP ratios closer to that of the United States—about 1.7 and 1.9 percent, respectively. The ratio for Italy was 1.3 percent in 1992.

R&D PERFORMANCE BY SECTOR

- Industry is estimated to account for 72 percent of the Nation's 1994 R&D performance total. The estimated $124 billion R&D performance by industry represents a 1-percent increase from 1993 levels, or, in real terms, a decline of 1 percent. Most (81 percent and growing) of industry's expected R&D performance total will be company funded; Federal funding is expected to account for the rest (19 percent). The Federal share of industry's performance total has fallen considerably; it was 33 percent of industry total in 1987.

- The Federal Government performed an estimated $17 billion of R&D in 1994. This sum is 4 percent higher than 1993 levels, or 2 percent higher after adjusting for inflation. Most of the increase is for the intramural R&D activities of the National Aeronautics and Space Administration (NASA) and the Department of Health and Human Services (HHS). In total, Federal agencies accounted for 10 percent of the U.S. 1994 R&D performance: This performance share has been fairly stable over the past 10 years.

- The Nation's universities and colleges, including university administered Federally Funded Research and Development Centers (FFRDCs), are estimated to have performed 15 percent, or $26 billion, of the total U.S. 1994 R&D effort. Estimated performance by universities and colleges is $21 billion (a 3-percent inflation-adjusted gain from 1993), and that by FFRDCs is $5 billion (down 4 percent in real terms). Overall, real R&D performance growth during 1985–94 was stronger for the academic sector than for any other sector of the economy.

R&D PERFORMANCE BY STATE

- Data are available on the State distribution of 1991 R&D performance by industry, academia, and Federal agencies, and the federally funded R&D activities of nonprofit institutions. Six States (California, New

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[1] National Science Foundation, *Federal R&D Funding by Budget Function: Fiscal Years 1993-95,* NSF 94-319 (Arlington, VA, 1994)

York, Michigan, New Jersey, Massachusetts, and Pennsylvania) accounted for roughly one-half of the U.S. total and 10 States (adding Texas, Illinois, Ohio, and Maryland) accounted for over two-thirds of the national effort. In each of these 10 States, more than $5 billion was spent on R&D.

- The 25 States with the smallest in-State R&D performance collectively accounted for 7 percent of the R&D conducted nationwide in 1991.

- As a percentage of gross state product (GSP), R&D performance in New Mexico was largest in 1991 at an 8.5-percent share. California, which led the Nation in terms of total R&D performance, had an R&D/GSP ratio of 3.7 percent—seventh highest among the States.

CHARACTER OF R&D WORK

- An estimated $100 billion was spent on development in 1994. Applied research reached $41 billion, and basic research, $31 billion. After adjusting for inflation, these figures are unchanged from their levels of a year earlier.

- As a share of the expected 1994 R&D total, development accounts for 58 percent of U.S. expenditures, applied research for 24 percent, and basic research for 18 percent.

- Since 1985, the share of R&D expended for development has declined from 65 percent; that for basic research has climbed steadily from its then-estimated 13-percent share.

R&D SCIENTISTS AND ENGINEERS

- An estimated 960,500 scientists and engineers were employed in 1991 on R&D activities in the United States. This figure represented an increase of about 4 percent from the 1989 estimated level of 924,600 and was a 20-percent increase over the 1985 figure of 801,900. Most of the change occurred in the industrial sector. In 1991 the Nation spent an average $167,000 on R&D per each of these R&D scientists and engineers.

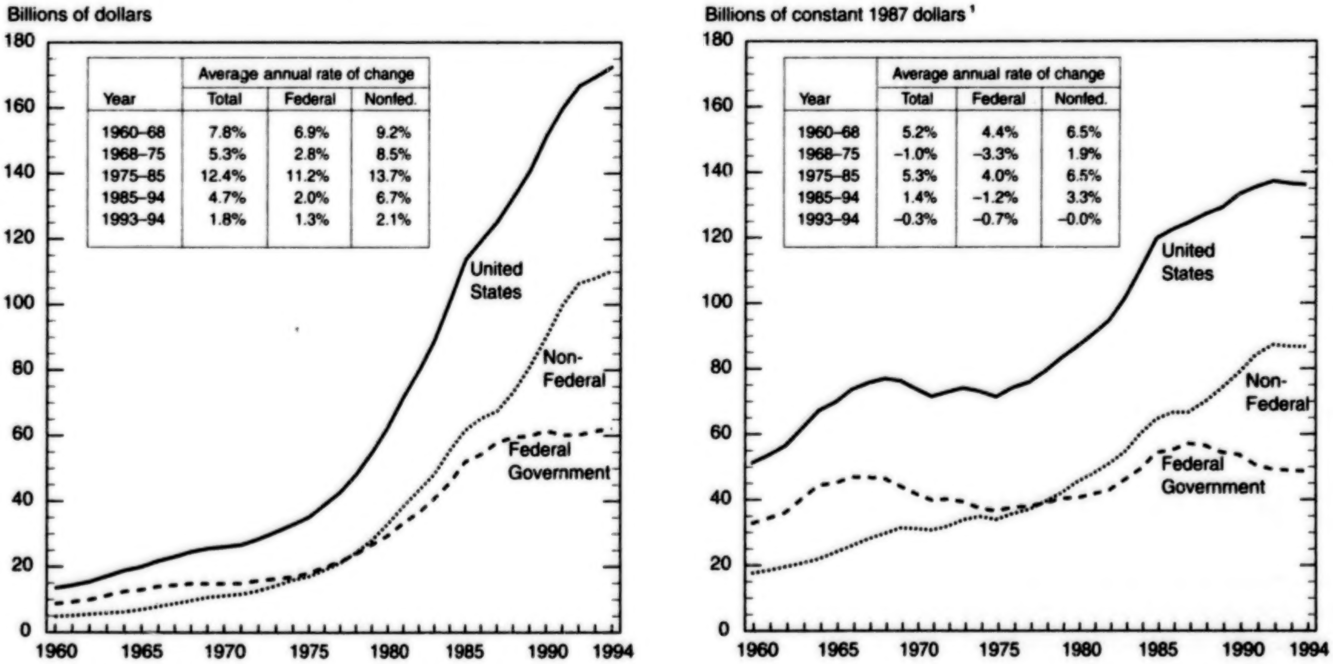
- There were 437,200 employed doctoral scientists and engineers in the United States in 1991. These doctorate-holders reported that they were involved in R&D activities more than in any other type of work: R&D, including the management of R&D projects, accounted for 43 percent of their primary work activities reported.

TRENDS IN NATIONAL R&D SUPPORT

U.S. expenditures on R&D are estimated to have reached $173 billion in 1994 (chart 2). This total is a 2-percent increase over estimated 1993 expenditures—$170 billion—and unchanged after adjusting for expected inflation.[2] The Federal Government provided 36 percent ($62 billion) of total funds; and non-Federal sectors of the economy, i.e., industry, State governments, universities and colleges, and other nonprofit institutions, provided the remaining 64 percent ($110 billion). The level-funding of total R&D in 1994 continues the trend of slow growth in real R&D support which began in 1986. Not since the early seventies has there been a period of such protracted low growth in national R&D support.

Starting in 1969 and for nearly a decade, R&D growth failed to keep up with either inflation or general increases in economic output. In fact, between 1968 and 1975, real R&D expenditures declined 7 percent as both business and Government deemphasized funding for research programs. Federal support in particular fell considerably during this period (down 21 percent in real

Chart 2
National R&D funding by source



Year	Average annual rate of change		
	Total	Federal	Nonfed.
1960–68	7.8%	6.9%	9.2%
1968–75	5.3%	2.8%	8.5%
1975–85	12.4%	11.2%	13.7%
1985–94	4.7%	2.0%	6.7%
1993–94	1.8%	1.3%	2.1%

Year	Average annual rate of change		
	Total	Federal	Nonfed.
1960–68	5.2%	4.4%	6.5%
1968–75	–1.0%	–3.3%	1.9%
1975–85	5.3%	4.0%	6.5%
1985–94	1.4%	–1.2%	3.3%
1993–94	–0.3%	–0.7%	–0.0%

[1] Based on GDP implicit price deflator.

NOTE: Data are preliminary for 1993 and estimated for 1994.

SOURCE: National Science Foundation/SRS; table B–3 terms). Both Federal defense- and nondefense-related R&D programs declined (chart 2).

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[2] Real growth for 1994 is derived using the Office of Management and Budget GDP implicit price deflator estimate of 2.1 percent.

Following recovery from the 1974 oil embargo and the 1975 recession, a significant funding reversal occurred. U.S. R&D expenditures more than tripled within just 10 years, climbing from $35 billion in 1975 to $114 billion in 1985. After adjusting for inflation, the 10-year increase was approximately 67 percent.

During the first half of this period (1975–80) there was considerable growth in Federal R&D funding for nondefense activities. Although defense-related R&D expenditures rose annually, much of the Federal R&D gain was attributable to energy-related R&D (particularly nuclear energy development) and to greater support for health-related R&D. Non-Federal R&D increases were concentrated in industry and resulted largely from greater emphasis on energy conservation and improved use of fossil fuels. Consequently, energy concerns fostered increases in R&D funding by both Federal and non-Federal sources. Support for energy R&D rose 140 percent in real terms between 1974 and 1979 and accounted for one-half of the national increase in real R&D spending.

Overall, the U.S. constant-dollar investment in total R&D grew at an average annual rate of 4 percent during 1975–80. Although the rate of increase remained rather steady through 1982 (4 percent annually), the focus of the national R&D effort began to shift heavily toward defense-related activities in the early eighties.[3] Largely as a result of increases in defense R&D, growth in total R&D expenditures accelerated to an 8-percent average annual rate over 1982–85: not since the space-inspired spending bulge in the early sixties had R&D in the United States grown so rapidly during any 3-year period.

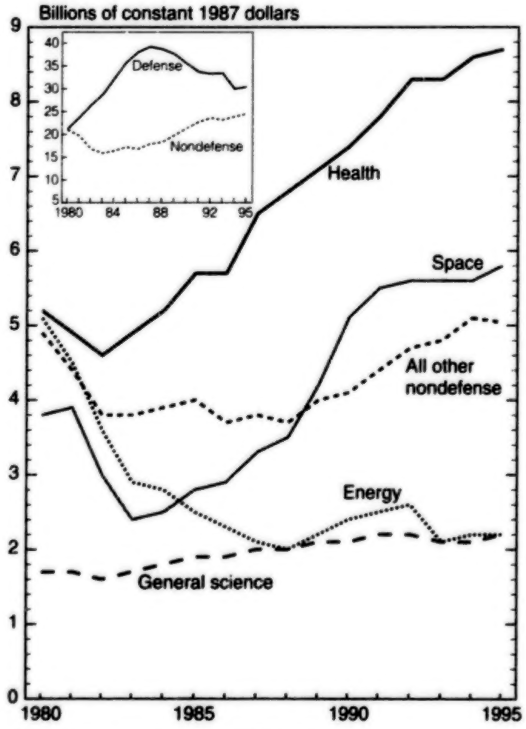
This pattern of a generally increasing rate of real R&D growth, however, changed abruptly in the mid-eighties. From 1985 to 1994, R&D spending slowed to a 1-percent annual real rate of increase. Slackening in both Federal and non-Federal support contributed to this slowing though Federal support is declining at a faster rate.

TRENDS IN FEDERAL SUPPORT

As a share of the national R&D total, Federal Government support has continued to slip in recent years. Long the dominant provider of the Nation's R&D funds, the Federal share first fell below 50 percent in 1978; between 1980 and 1990, the Federal Government consistently provided 47 to 44 percent of all funds spent on R&D in the United States. Its share has further dropped to an estimated 36 percent in 1994.[4] Even with its declining share of the national total, Federal R&D support grew from $29 billion in 1980 to an estimated $62 billion in 1994, or by about 20 percent after adjusting for inflation. The real rate of increase was particularly strong in the early eighties and accounted for most of the gain for the entire decade. From 1980 to 1985, Federal R&D support grew on average by 6 percent annually. Support then slowed considerably in 1986 reflecting the budgetary constraints imposed on all Government programs, including those mandated by the Balanced Budget and Emergency Deficit Control Act of 1985 (also known as the Gramm-Rudman-Hollings Act) and subsequent legislation (notably the Budget Enforcement Act of 1990, which legislated that new spending increases be offset with specific spending cuts).

Chart 3

Federal R&D budget authority, by function: 1980–1995



NOTE: Data are estimated for 1994 and 1995.

SOURCE: National Science Foundation/SRS; table B–21

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[3] Industry R&D expenditures on energy and pollution abatement also slowed in the early eighties. During 1981 and 1982, such expenditures increased at only one-third the rate reported for the previous 4 years.

[4] The sample design for estimating industry R&D expenditures was revised for 1991 and later years. The effect of the change in industry's sample design was to reduce the Federal share of the national R&D total to 38 percent in 1991, down from the 41-percent share previously published for 1991. See appendix A (and table A-2) for more information on these survey changes and their impact on the R&D estimates.

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As a consequence, real Federal R&D support is estimated to have declined on average by 1 percent per year over 1985–94.

Practically all the gain in Federal R&D support during the early eighties was due to large increases in defense spending. This statement is borne out by data on U.S. budget authority (chart 3). For example, defense activities of the Department of Defense (DOD) and the Department of Energy (DOE) accounted for one-half of total Federal R&D budget authorizations in 1980.[5] By 1986, such defense-related spending peaked at 69 percent of the Federal R&D budget authority.

Since then, Federal R&D spending priorities have shifted as a result of increasing budgetary pressures and altered U.S. security concerns in the evolving international environment. The defense buildup in the early and mid-1980s gave way to a period of moderate cuts in the late 1980s, a leveling in the early 1990s, and a return to planned moderate cuts in the mid-1990s. Annual R&D funding data reflect these Federal policy changes. Since 1986, the growth rate in Federal authority for civilian-related R&D has been higher than for defense-related R&D. Increases for health- and space-related R&D are particularly strong, whereas estimated R&D expenditures for defense programs declined by 23 percent—in real terms—during 1987–94. As a result, defense-related R&D accounts for an estimated 56 percent of the 1994 total Federal R&D budget authority.

R&D is estimated to account for 15 percent of the 1994 defense-related budget authority and 3 percent of all Federal nondefense funds (table 1).[6] In nondefense areas R&D accounted for 60 percent of energy funds; 59 percent of general science funds, 94 percent of which is devoted to the conduct of basic research; 56 percent of space funds, with about 27 percent of the R&D funding total slated for continued development of the planned manned Space Station Freedom; and 9 percent of health funds, of which 94 percent is directed toward the research programs of the National Institutes of Health.

For the Nation as a whole, defense R&D climbed from 24 percent of the total R&D effort in 1980 to 31 percent in 1987. In 1994 defense R&D is estimated to have dropped to a 20-percent share of total (chart 4). These shares by national objective represent a distribution of performer-reported R&D data. They are

Table 1.

Budget authority for R&D as a percentage of total Federal budget authority, by function: 1994

(Dollars in millions)

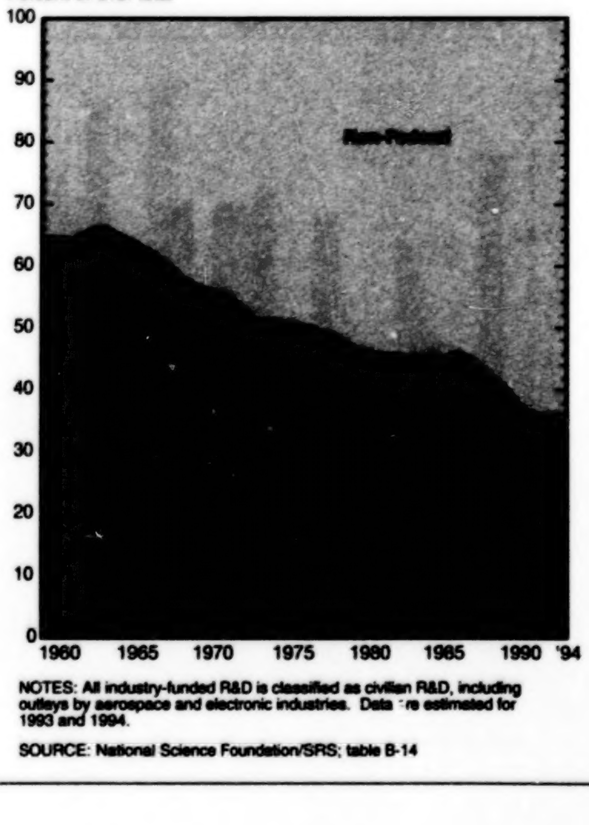
Budget Function	R&D total	Federal total	R&D % share
Total budget	68,311	1,504,701	4.5
On-budget	68,311	1,219,782	5.6
National defense	38,020	260,918	14.6
Nondefense (on-budget)	30,291	958,864	3.2
Health	10,936	116,075	9.4
Space research and technology	7,212	12,915	55.8
Energy	2,854	4,741	60.2
General science	2,717	4,600	59.1
Natural resources and environment	1,992	22,163	9.0
Transportation	1,892	38,918	4.9
Agriculture	1,188	16,087	7.4
All other	1,500	743,365	0.2

NOTES: Data are derived from the administration's 1995 budget proposal. On-budget totals are for all Federal Government transactions except those of the social security trust funds (Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds) and the Postal Service

SOURCES: National Science Foundation/SRS, and Office of Management and Budget

Chart 4

R&D spending by national objective and source



NOTES: All industry-funded R&D is classified as civilian R&D, including outlays by aerospace and electronic industries. Data are estimated for 1993 and 1994.

SOURCE: National Science Foundation/SRS; table B-14

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[5] These percentage share estimates of defense-related R&D expenditures are based on Federal budget authorization totals, not on data reported by the performers doing the R&D.

[6] NSF, *Federal R&D Funding by Budget Function: Fiscal Years 1993–95*, NSF 94-319, (Arlington, VA, 1994). These data reflect estimates contained in the administration's 1995 Federal budget proposal.

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distinct from the budget authority shares, reported above, that are based on the various functional categories that comprise the Federal budget. (See appendix A). Between 1980 and 1994 space-related R&D support has annually accounted for 3 to 5 percent of the national R&D total. In spite of the recent expansion in Federal R&D support for nondefense-nonspace programs, such support accounted for just 11 percent of the estimated U.S. 1994 R&D total, compared with its 18-percent share in 1980 and its 12-percent share in 1986.

TRENDS IN NON-FEDERAL SUPPORT

Concurrent with gains in Federal R&D spending, R&D support from non-Federal sources also increased substantially in the first half of the eighties—up on average by 7 percent per year after inflation between 1980 and 1985. Between 1985 and 1994, non-Federal real R&D support slowed considerably—to an average annual rate of 3 percent.

Most non-Federal R&D support is provided by industry. Of the estimated 1994 non-Federal total ($110 billion), 93 percent ($102 billion) was company funded. Indeed, industry's share of the national R&D funding total first surpassed that of the Federal Government in 1980 and has remained at 50 percent and higher ever since. From 1980 to 1985 industrial support for R&D increased at a 7-percent average annual inflation-adjusted rate. This growth was maintained through both the mild 1980 recession and the more severe 1982 recession (chart 5). Key factors behind increases in industrial R&D included a growing concern with international competition, especially in high-technology industries; the increasing technological sophistication of products, processes, and services; and general growth in defense-related industries such as electronics, aircraft, and missiles.

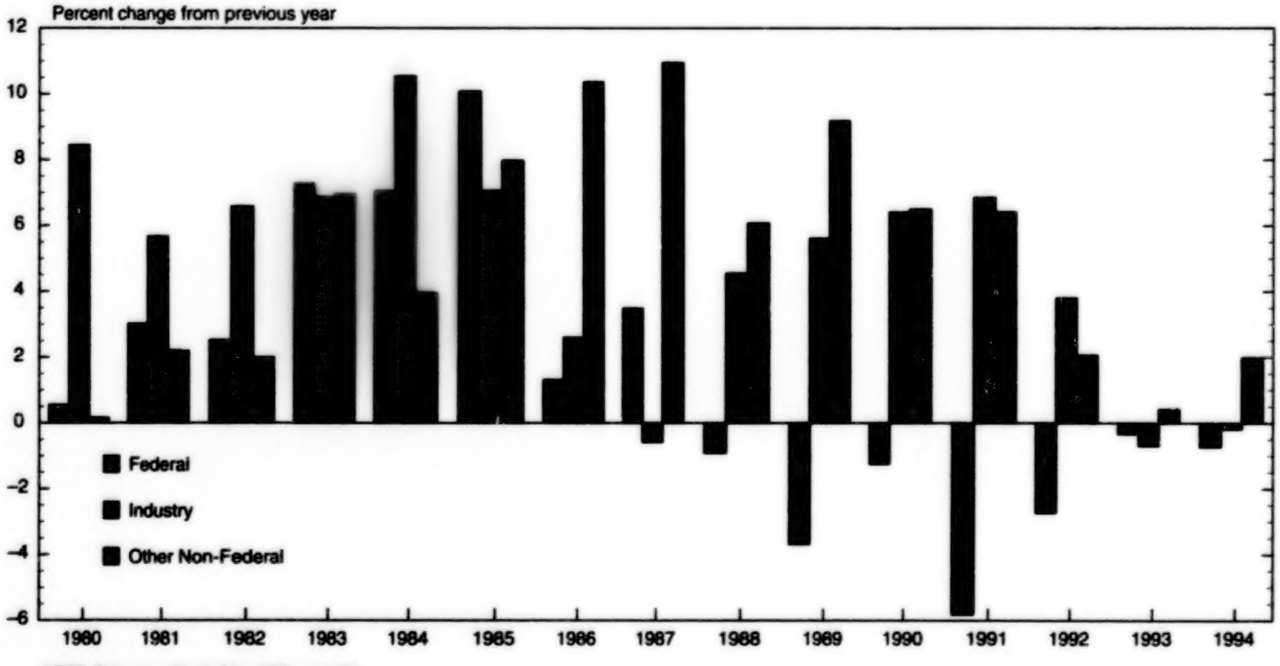
Between 1985 and 1994, growth in R&D support from industry declined dramatically, averaging only 3 percent per year in real terms. Individual industries show very different trends in their R&D expenditures, and the factors influencing R&D budget decisions vary across industries.

Companies in the communications equipment, primary metals, and stone, clay, and glass industries have experienced the greatest slowing in R&D support since the mid-1980s, actually falling in several years (even before adjusting for inflation) during this period. R&D funding growth has been strongest from the chemicals and the drugs and medicine industries, as well as from companies classified in the nonmanufacturing sector (table B-27).

Chart 5

Annual changes in national R&D spending, by source of funds: 1980–94

(based on constant 1987 dollars)



NOTE: Data are estimated for 1993 and 1994.
As a result of a new sample design for the underlying Survey of Industrial Research and Development, data for the years 1988–92 have been revised. (See appendix A.)

SOURCE: National Science Foundation/SRS; table B-3

In contrast to the sluggishness in industrial R&D support, strong support from other non-Federal sectors—universities, State and local governments, and other nonprofit institutions—has continued in the late 1980s and early 1990s (chart 5). Between 1980 and 1985 the average annual rate of real R&D support from these sectors was 5 percent. Such non-Federal nonindustrial R&D expenditures increased at a 6-percent real annual rate between 1985 and 1994. Most of these R&D dollars are used for research within the academic sector.

MEASURES AND COMPARISONS OF NATIONAL RESOURCES FOR R&D

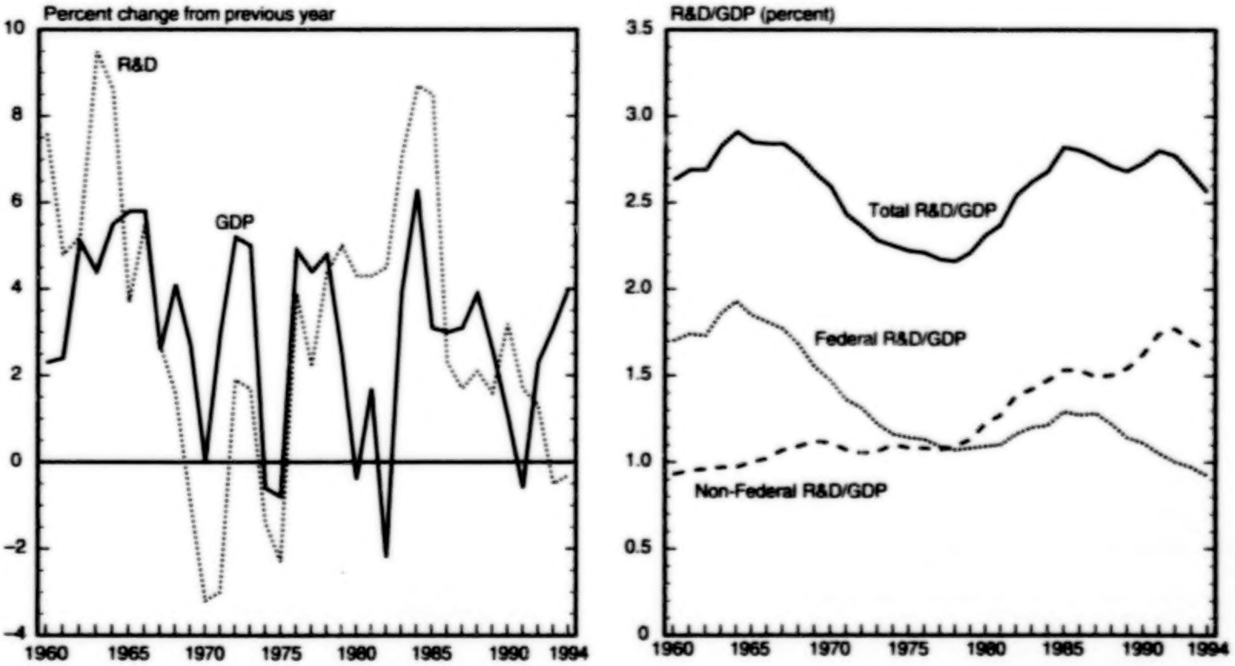
This section examines two indicators of R&D spending: (1) the ratio of total R&D expenditures to GDP and (2) the ratio of Federal funds expended for R&D to total Federal funds. Also presented is a comparison of U.S. R&D resources with those of other countries. These measures and comparisons show that, as a result of the overall recent leveling trend from strong growth in the early eighties, the U.S. commitment to R&D seems to have plateaued during the past decade. Relative to the increases of its major international competitors, the U.S. R&D effort has eroded slightly, although many of these countries are also now experiencing a slowing in their R&D effort.

U.S. R&D/GDP RATIO

The ratio of R&D expenditures to GDP may be used as a measure of the Nation's commitment to R&D. In 1994 total U.S. support for R&D is estimated to have reached $173 billion. This sum equals 2.6 percent of an estimated $6.74 trillion GDP, slightly lower than the estimated 1993 ratio (table B-15).

A review of the U.S. R&D/GDP ratio over time shows a peak of 2.9 percent in 1964 with a gradual decline to 2.2 percent in 1978. This drop largely reflected Federal cutbacks in defense and space R&D programs, although gains in energy R&D activities between 1975 and 1979 resulted in a relative stabilization of the ratio at around 2.2 percent. Over the entire 1965–78 period the annual percentage increase in real R&D was less than the annual percentage increase in real GDP. In years that real R&D spending decreased, real GDP also fell, but at a lower rate (chart 6).

Chart 6
Annual changes in GDP and R&D, and the R&D/GDP ratio: 1960–94
(based on constant 1987 dollars)



NOTE: Data are estimated for 1993 and 1994.
As a result of a new sample design for the underlying Survey of Industrial Research and Development, data for the years 1988–92 have been revised. (See appendix A.)

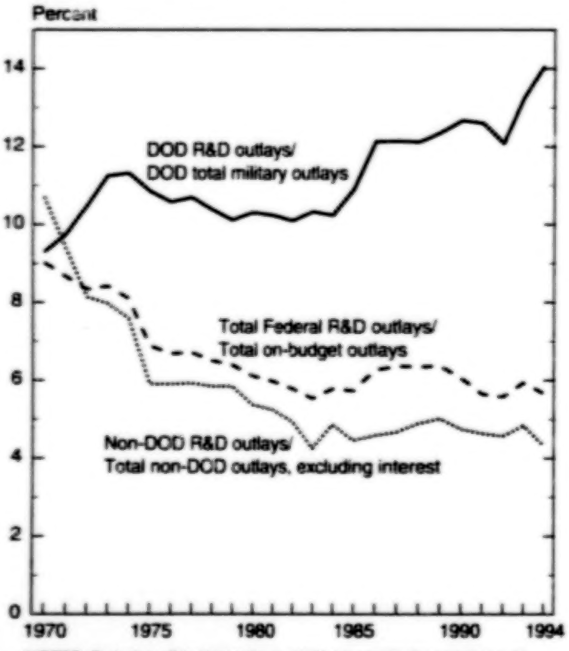
SOURCE: National Science Foundation/SRS; tables B-1, B-3, and B-15

From 1979 to 1985 the R&D/GDP ratio increased steadily from 2.2 to 2.8 percent. This increase was as much due to a slowdown in GDP growth as to increased spending on R&D activities. For example, the 1980 and 1982 recessions resulted in a slight decline in real GDP; there was no corresponding reduction in R&D spending. In contrast, during previous recessions changes in support for R&D tended to parallel—and even exceed—the adverse movements of the broader economic measures. Since 1985 the R&D/GDP ratio has trended slightly downwards as a result of declining growth in Federal R&D expenditures and slow-to-declining growth in non-Federal R&D expenditures.[7]

U.S. FEDERAL R&D FUNDS/ TOTAL BUDGET RATIO

One way to gauge the Government's priority for R&D is to compare Federal outlays for R&D with Federal outlays for all purposes. In 1994 total Federal outlays (for on-budget programs only) are estimated at $1.22 trillion.[8] An estimated 5.7 percent ($68.1 billion) of total outlays is for R&D (chart 7).

Chart 7
Ratio of Federal R&D outlays to total budget outlays: 1970–94



NOTES: Excludes off-budget outlays, which are mostly for social security programs. Data are estimated for 1994.

SOURCES: National Science Foundation/SRS, Department of Commerce, and Office of Management and Budget

From 1970 to 1983, R&D outlays as a percentage of total outlays declined steadily, dropping from 9.0 to 5.5 percent. The rate of decline was most rapid in the early seventies and slowed considerably from 1975 on. Throughout most of the 1970–83 period, the ratio of R&D to total outlays for the Department of Defense hovered between 10 and 11 percent. This ratio contrasts with the falling share of R&D in the non-DOD part of the budget (even after excluding outlays for interest payments), from 10.7 percent in 1970 to 4.3 percent in 1983. This declining share was not confined to one or two agencies but was a result of both slow growth in most non-DOD agencies' R&D outlays and a relatively rapid expansion in the non-R&D component of the Federal budget for civilian agencies.

After 1983 the overall Federal R&D outlay ratio first moved up and then back down: The ratio peaked at 6.4 percent in each year of the 1987–89 period before settling back to 5.7 percent in 1994. Most of the initial ratio increases were due to a large increase in the DOD R&D outlay ratio. This increase was not offset by the declining non-DOD ratio—as had been the case in the 1970s—or by the growing share of the Federal budget for interest payments.[9] During the past couple of years, however, the declining R&D outlay ratio has stemmed largely from a decrease in the R&D share of the non-DOD component of the budget.

INTERNATIONAL COMPARISONS

The R&D/GDP ratio discussed above can be used to determine the relative emphasis placed on R&D activities by the United States and other countries. Another useful measure is to compare the number of R&D scientists and engineers in a country with its total labor force. Use of these ratios bypasses many of the problems in interpretation caused by inflation, exchange-rate fluctuations, different unit costs, and variations in the volume of research efforts. Caution must nonetheless be exercised in making even these international comparisons, because each country compiles its R&D and personnel data somewhat differently.

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[7] See appendix A for summary statistics detailing the effects on the U.S. R&D/GDP ratios from recent changes in the NSF survey of industry R&D performance.

[8] Almost all off-budget receipts and disbursements are for social security programs (the Federal Old-Age and Survivors Insurance and the Federal Disability Insurance trust funds) which are excluded from the budget totals by the Balanced Budget and Emergency Deficit Control Act of 1985. Off-budget outlays for FY 1994, as provided in the President's 1995 budget proposal, are estimated at $281 billion. See Office of Management and Budget, *The Budget of the United States Government, Fiscal Year 1995* (Washington, DC: GPO, 1994).

[9] As a percentage of total Federal on-budget outlays, interest payments on the national debt rose from 13.8 percent in 1983 to 19.4 percent in 1989. In 1994 the estimated share of on-budget outlays for interest payments was 19.3 percent.

R&D/GDP Ratios

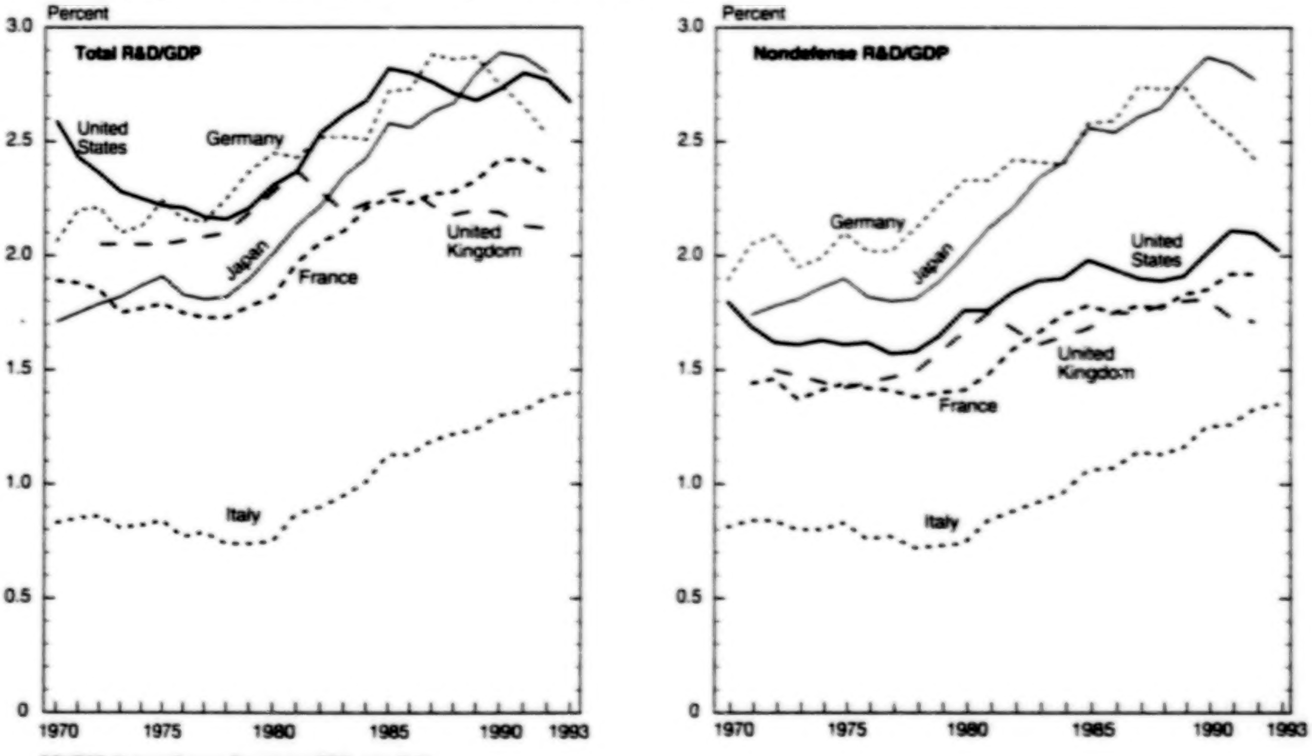
The United States spends more money on R&D activities than does any other country; in fact, it spends more than Japan, Germany, France, the United Kingdom, and Italy combined.[10] In 1992—the latest year for which foreign data are available—the U.S. spent the same proportion of its GDP on R&D as Japan (2.8 percent) and its ratio of R&D funds to GDP was slightly greater than Unified Germany (2.5 percent). In comparison, the ratio for France was estimated at 2.4 percent and for Italy at 1.4 percent. The British R&D/GDP ratio was 2.1 percent in 1992.

During the early to mid-1960s, the United States ranked highest among these countries in terms of both R&D expenditures and R&D/GDP ratios (almost 3 percent). After 1964, however, the U.S. ratio began to decline, as Federal R&D spending for defense and space was cut back while the U.S. GDP continued to increase. At the same time the ratios in other countries—notably (West) Germany and Japan—slowly increased. These divergent trends continued until the late seventies, at which point the U.S. ratio had dropped to 2.2 percent and was about equal to those in (West) Germany, the United Kingdom, and Japan (chart 8).

From the late seventies through the early eighties, the ratios in all countries were again increasing, and by 1985 had reached 2.8 percent in the United States, 2.7 percent in (West) Germany, and 2.6 percent in Japan. France and the United Kingdom reported 2.3-percent R&D/GDP ratios. Since 1985 the R&D/GDP ratios each of these industrialized countries have fluctuated within a narrow range. Japan's ratio peaked at 2.9 percent in 1990 and then dipped back to 2.8 percent in 1992. R&D in

Chart 8

R&D expenditures as a percentage of GDP, by country



SOURCE: National Science Foundation/SRS; table B-20

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[10] For example, the United States spent $138 billion on R&D in 1992 (constant 1987 dollars). Comparable R&D expenditures—based on purchasing power parity exchange rates—were $57 billion for Japan, $30 billion for Germany, $21 billion for France, $17 billion for the United Kingdom, and $12 billion for Italy. For related international data, see NSF, *International Science and Technology Update: 1991*, NSF 91-309 (Washington, DC, 1991), and National Science Board, *Science & Engineering Indicators-1993*, NSB 93-1 (Washington, DC: GPO, 1993). Germany's data for 1991 and later years include activity within the former East Germany.

Germany also reached 2.9 percent of GDP (in 1989) but has since declined to 2.5 percent, a result—in large part—of the inclusion of data for the former East Germany in its official statistics. The R&D/GDP ratio for France first rose and has since held level at 2.4 percent, whereas the British ratio has declined slightly—to 2.1 percent. As reported earlier, the U.S. ratio has trended generally downwards since 1985 as a result of declining defense R&D support.

If defense activities are excluded from the R&D figures, the United States lags the two other leading R&D-performing countries in R&D spending as a portion of GDP. The nondefense R&D/GDP ratio for the United States in 1992 (2.1 percent) was considerably lower than those for Germany (2.4 percent) and Japan (2.8 percent) (chart 8). About 75 percent of the U.S. R&D effort was devoted to nondefense activities, as compared with more than 95 percent in these two countries. France and the United Kingdom, which have substantial defense R&D efforts, each reported nondefense R&D/GDP ratios closer to that of the United States—about 1.7 and 1.9 percent, respectively. The ratio for Italy was 1.3 percent in 1992.

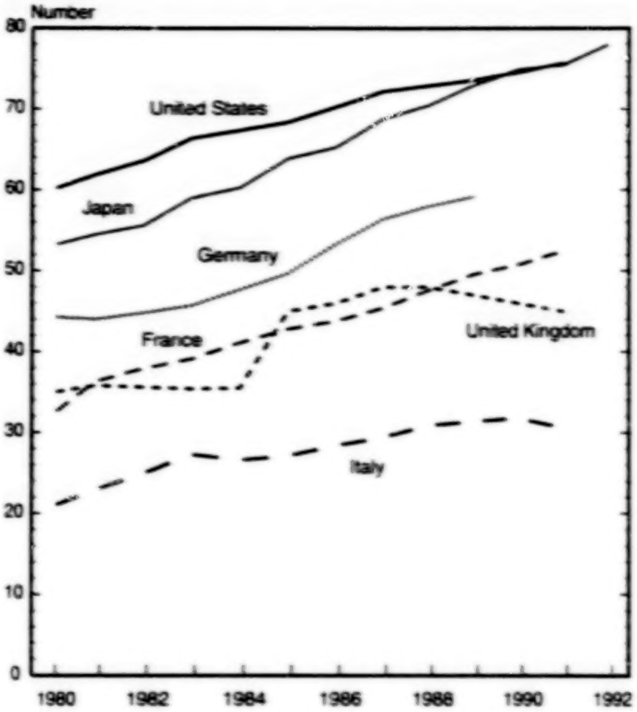
R&D SCIENTISTS AND ENGINEERS/LABOR FORCE RATIOS

Comparing the number of scientists and engineers employed in full-time-equivalent (FTE) R&D jobs with the total labor force results in a ratio higher in the United States than in the other industrialized market economies. There were about 76 FTE R&D scientists and engineers (S&Es) per 10,000 in the U.S. labor force in 1991 (chart 9). This ratio increased annually from a level of 55 per 10,000 in 1976 to its estimated current level.

Ratios in the United Kingdom, Japan, Germany, France, and Italy also have been increasing annually since the mid-1970s. However, those for the United Kingdom and Italy apparently peaked in the late eighties while the share of these highly trained workers in the total labor forces of Japan and France continued to increase. (Data for years later than 1989 are unavailable for Germany.) The rate of growth in Japan has been especially rapid. The Japanese ratio increased from 50 R&D S&Es per 10,000 workers in 1979 to 76 per 10,000 in 1991.[11] By comparison, there were 31 FTE R&D scientists and engineers per 10,000 in Italy; 45 per 10,000 in the United Kingdom; 53 per 10,000 in France; and 59 per 10,000 in (West) Germany (in 1989).

Chart 9

Scientists and engineers engaged in R&D per 10,000 labor force, by country: 1980–92



SOURCE: National Science Foundation/SRS; table B-19

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[11] Japanese and U.S. surveys on the number of scientists and engineers engaged in R&D are not strictly comparable. Estimates for most of the U.S. data are adjusted to estimate full-time equivalence; Japanese surveys, on the other hand, ask for the total number of S&Es engaged in R&D regardless of the amount of time devoted to R&D. Japanese data on S&Es exclude those engaged in R&D in the social sciences and humanities. The U.S. data exclude such personnel from the industry sector alone. The historical series for these U.S. personnel data was revised in this *National Patterns*. Data for 1985 and later years are not directly comparable with the data for 1984 and earlier years. See appendix A for a review of these changes.

NATIONAL R&D PERFORMANCE PATTERNS—BY SECTOR

The sectoral shares of U.S. R&D performance have shifted slightly during the past decade. In 1980, industry performed 71 percent of the Nation's R&D; the academic sector—including FFRDCs administered by universities—accounted for 13 percent; the Federal Government, 12 percent; and the nonprofit sector, 3 percent. As industry's defense-related R&D efforts accelerated in the early eighties, its share of the performance total rose to a 1985 peak of 74 percent. Concurrently, academic R&D performance slipped slightly, to 12 percent of the U.S. total, and the Federal share dropped to 11 percent. The nonprofit R&D share remained at 3 percent in 1985.

Growth in academic R&D performance has since outpaced that of the other sectors. From 1985 to 1994 real R&D performance growth by universities and colleges (excluding FFRDCs) is estimated at a 5-percent annual rate, compared with an estimated average annual real growth of 1 percent for industry. Federal intramural performance during this period is virtually unchanged; and the estimated increase in real R&D performance by the nonprofit sector is 3 percent per year. As a result of these divergent R&D performance trends, industry is expected to account for 72 percent of the national R&D performance total in 1994. Academia's share (including FFRDCs) should climb to 15 percent; the Federal Government's share is estimated at 10 percent; and the nonprofit sector is expected to account for 3 percent of U.S. R&D performance (table 2).

INDUSTRY

R&D performance by industry—including $2 billion performed in FFRDCs administered by industrial firms—is estimated to have reached $124 billion in 1994. This total is a 1-percent increase over the estimated 1993 total. After adjusting for expected inflation, industry's performance of R&D is expected to decline 1 percent in 1994 (chart 10).

For all industries combined, non-Federal—primarily company—financing of industrial R&D performance increased 2 percent in 1994 and is unchanged after adjusting for inflation. Overall, companies funded about 81 percent ($100 billion) of their R&D performance, with the Federal Government funding the rest ($24 billion, or 19 percent of total). Federal funds for industrial R&D activities are expected to be down 2 percent in inflation-adjusted terms. As recently as 1987 the Federal funding share of industry's performance total was 33 percent; however, the Federal share of industry's performance has been steadily declining since its peak of 59 percent reached in 1959.

Individual industries show very different R&D performance trends and shares of the industry R&D total since the early eighties. R&D performance in aerospace firms has been the most volatile, rising from 21 percent of the industry performance total in 1980 to 26 percent in 1985 and then down to 13 percent of the 1992 R&D total (table 3). Not coincidentally, these movements parallel shifts in Federal defense-related support during the period. Overall, the greatest rates of R&D performance growth in 1980–92 occurred in chemicals, drugs and medicines, scientific instruments, and nonmanufacturing industries. In this latter catch-all category, the R&D activity is concentrated in nonmanufacturing firms whose primary activity involves communications services and computer-related and engineering services.

A new sample was selected in 1992 for the underlying industry R&D survey, the first since 1987. As a result, data for 1991 and 1992 reflect more recent information about the distribution of R&D expenditures across industry groups, the R&D performance of smaller firms, and the R&D performance of firms classified in the nonmanufacturing sector. Shifts in share of R&D reported for 1992 in table 3 reflect the revised information obtained using this new sample. (See appendix A for a more complete discussion of the sample selection.)

Table 2.

Intersectoral transfers of funds used for performance of research and development, basic research, applied research, and development: 1994 (estimated)

(in millions of dollars)

Source of funds	Federal Government	Industry[1]	Universities and colleges	U&C associated FFRDCs	Other nonprofit institutions[1]	Total	Percentage distribution, sources
			Research and development				
Federal Government	17,200	24,000	12,200	5,100	3,700	62,200	36.0%
Industry	—	99,800	1,450	—	800	102,050	59.1
Universities and colleges	—	—	5,300	—	—	5,300	3.1
Other nonprofit institutions	—	—	1,550	—	1,450	3,000	1.7
Total	17,200	123,800	20,500	5,100	5,950	172,550	100.0
Percentage distribution, performers	10.0%	71.7%	11.9%	3.0%	3.4%	100.0%	
			Basic research				
Federal Government	2,700	2,700	8,650	2,900	1,200	18,150	58.3%
Industry	—	7,000	850	—	370	8,220	26.4
Universities and colleges	—	—	3,250	—	—	3,250	10.4
Other nonprofit institutions	—	—	950	—	580	1,530	4.9
Total	2,700	9,700	13,700	2,900	2,150	31,150	100.0
Percentage distribution, performers	8.7%	31.1%	44.0%	9.3%	6.9%	100.0%	
			Applied research				
Federal Government	4,900	5,200	2,500	820	1,050	14,470	35.3%
Industry	—	23,100	490	—	290	23,880	58.2
Universities and colleges	—	—	1,680	—	—	1,680	4.1
Other nonprofit institutions	—	—	490	—	520	1,010	2.5
Total	4,900	28,300	5,160	820	1,860	41,040	100.0
Percentage distribution, performers	11.9%	69.0%	12.6%	2.0%	4.5%	100.0%	
			Development				
Federal Government	9,600	16,100	1,050	1,380	1,450	29,580	29.5%
Industry	—	69,700	110	—	140	69,950	69.7
Universities and colleges	—	—	370	—	—	370	0.4
Other nonprofit institutions	—	—	110	—	350	460	0.5
Total	9,600	85,800	1,640	1,380	1,940	100,360	100.0
Percentage distribution, performers	9.6%	85.5%	1.6%	1.4%	1.9%	100.0%	

[1] Expenditures for FFRDCs administered by both industry and nonprofit institutions are included in the totals of their respective sectors. They are estimated to account for less than 2 percent and 15 percent, respectively, of the industry and nonprofit institutions performance totals. FFRDCs are organizations exclusively or substantially financed by the Federal Government to meet a particular requirement or to provide major facilities for research and training purposes.

[2] FFRDCs administrered by individual universities and colleges and by university consortia.

KEY: FFRDC = Federally funded research and development center

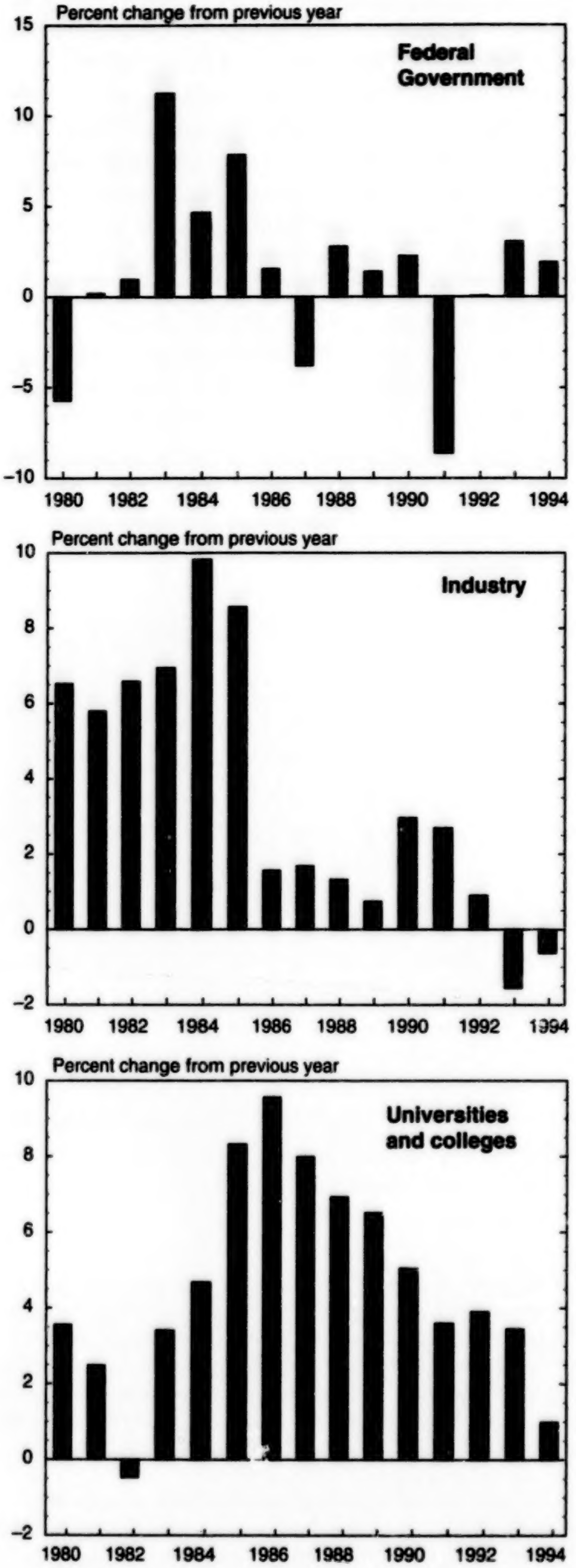
NOTES: Data are estimated.
State and local government funds are included in industry funds reported to industry performers and in university and college funds reported to university and college performers.

SOURCE: National Science Foundation/SRS

Chart 10

Changes in national R&D spending, by performer

(based on constant 1987 dollars)



NOTES: Data are estimated for 1993 and 1994.
As a result of a new sample design for the underlying Survey of Industrial Research and Development, data for the years 1988–92 have been revised.
(See appendix A.)

SOURCE: National Science Foundation/SRS; table B-4

Given the new sample, the share gains for specific nonmanufacturing industries are the most difficult to determine though there is little doubt that R&D performance within this broad industrial group has increased considerably since 1980. Fully 80 percent of the increase in total industrial R&D resulting from the new sample was reported for firms classified in the nonmanufacturing sector. These changes served to increase the nonmanufacturing 1991 total from about $10 billion previously reported to $21 billion. An additional $7 billion of R&D also was reclassified from manufacturing categories to nonmanufacturing. Although some of this data shifting stemmed directly from the selection of a new sample, a significant amount is believed to accurately reflect changes in the output mix of firms formerly classified in manufacturing industries. Even if a new sample had not been selected, the share of industry's R&D performance total attributed to the nonmanufacturing sector would have risen from about 4 percent in 1980 to an estimated 10 to 16 percent in 1992.

Federal financing for specific industries varied considerably. The Federal Government provided $25 billion for all industry R&D performance in 1992, the most recent year for which detailed industry-specific data are available by all sources of funds. Aerospace companies received 40 percent of all Government funds provided to industry. Consequently, 61 percent of the

Table 3.

Total industrial R&D performance, by industry: 1980, 1985, 1990, and 1992

Industry	1980	1985	1990	1992
Total (dollars in billions)	$44.5	$84.2	$109.7	$121.3
	— Distribution by industry—			
Drugs and medicines (283)	4%	4%	5%	7%
Industrial and other chemicals (28, excluding 283)	6	6	7	6
Petroleum refining and extraction (13, 29)	4	3	2	2
Other machinery, including computers (35)	13	13	13	13
Electrical equipment (36)	21	17	12	11
Aircraft and missiles (372, 376)	21	26	19	13
Other transportation (37, excluding 372, 376)	12	9	10	9
Professional and scientific instruments (38)	7	6	6	8
Other manufacturing industries	9	7	7	6
Nonmanufacturing industries	4	8	19	25

NOTES: Numbers in parentheses are SIC codes.
As a result of changes in the underlying survey design, data for 1990 and 1992 may not be directly comparable with those for earlier years.
(See accompanying text and appendix A.)

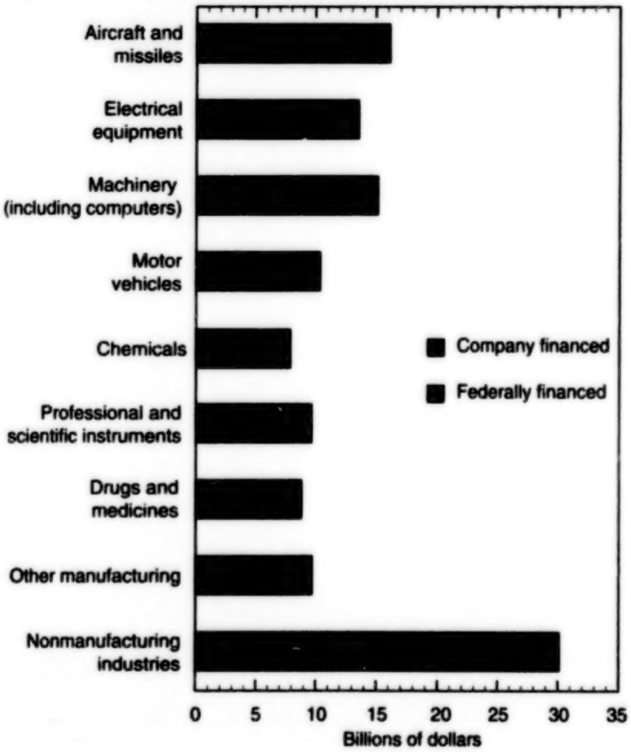
SOURCE: National Science Foundation/SRS, table B-26 aerospace industry's R&D dollars came from Federal sources and only about two-fifths came from companies' own funds (chart 11). In comparison, the electrical equipment industry financed 72 percent of its R&D from company funds; the machinery industry funded 93 percent; and chemical companies—including pharmaceutical firms—funded 98 percent of their R&D.

FEDERAL GOVERNMENT

The Federal Government performed an estimated $17 billion of the 1994 U.S. R&D total. This figure is a 4-percent increase from estimated 1993 levels, or about 2 percent higher after adjusting for inflation. Federal agencies accounted for 10 percent of the estimated national R&D performance effort, continuing the very gradual decline that began in the mid-1970s.

Until 1980 the Federal Government had been the second-largest R&D performer in the Nation. Its share of the national R&D performance total, however, fell from 16 percent in 1970 to 12 percent in 1980. This reduction was due primarily to cutbacks in space R&D programs: NASA funds for intramural R&D performance decreased by more than one-half in real terms during this period. As a result, in 1980 the academic sector—including associated FFRDCs—surpassed the Federal Government in share of national R&D performance.

Chart 11
Industrial R&D performance, by industry and source of funds: 1992



SOURCE: National Science Foundation/SRS; tables B-26, B-27, and B-28

Only three agencies had estimated intramural R&D expenditures that in 1994 exceeded $1.0 billion, including costs associated with planning and administering extramural R&D programs.[12] These three agencies account for 80 percent of intramural R&D performed by all Federal agencies. Intramural R&D performance by DOD is estimated to have decreased by an inflation-adjusted 1 percentage point to $8.8 billion. NASA's intramural real R&D is estimated to have increased 11 percent, to $2.6 billion, and that by the Department of Health and Human Services (HHS)—mostly by the National Institutes of Health—rose by about 6 percent, to $2.2 billion. All other Federal agencies spent an estimated $3.6 billion on intramural R&D—40 percent of which came from the Departments of Agriculture and the Interior.

UNIVERSITIES AND COLLEGES

Universities and colleges (excluding academically administered FFRDCs) accounted for an estimated 12 percent ($21 billion) of the 1994 national R&D performance effort. This total represents a 3-percent increase from 1993 levels, or 1-percent inflation-adjusted growth.

Unlike the industry and Federal sectors, overall R&D performance by the academic sector increased rapidly throughout the mid-1980s and continued to grow, though less rapidly, into the early 1990s (chart 10).[13] From 1980 to 1985 real growth averaged somewhat under 4 percent annually. Whereas real increases in the R&D performance of other sectors slowed considerably after 1985, that of universities and colleges increased to more than an estimated 5-percent average annual rate over the 1985–94 period.

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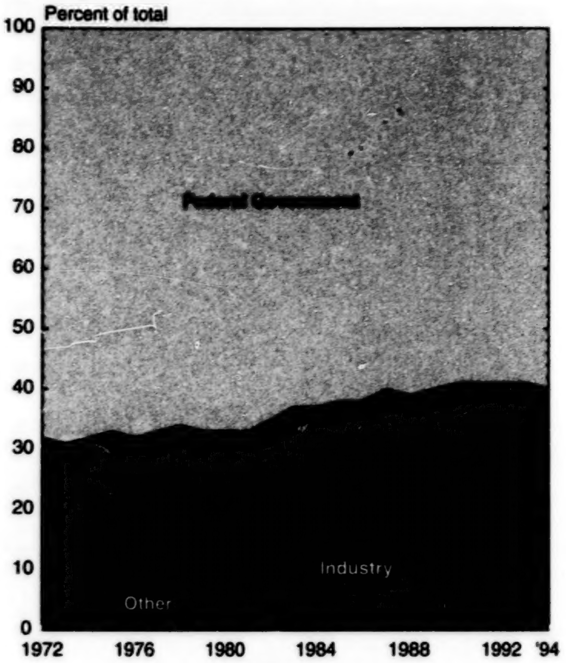
[12] Estimates are for FY 1994 Federal intramural obligations as reflected in the administration's 1994 budget proposal (see appendix A) and cover costs associated with planning and administering intramural and extramural R&D programs by Federal personnel as well as actual intramural R&D performance. See NSF, *Federal Funds for Research and Development: Fiscal Years 1992, 1993, and 1994*, vol. 42, Detailed Statistical Tables, NSF 94-328 (Arlington, VA, 1994).

[13] R&D data are for separately budgeted expenditures only. Consequently, they exclude that portion of salaries for research time or other research expenses financed by funds not specifically earmarked for R&D from State and local governments and other non-Federal sources, including endowments.

Chart 12

Source of funds for university and college R&D performance: 1970–92



NOTES: State and local government funds exclude general purpose appropriations that universities use at their discretion for R&D. Data are estimated for 1994.

SOURCE: National Science Foundation/SRS; tables B-2 and B-34

The Federal Government provides the major—albeit declining—share of the R&D funds used by universities and colleges. In the early 1980s Federal funds accounted for two-thirds of the academic total. By 1991, however, this share had dropped to a low of 58 percent and has risen slightly to an estimated 60 percent in 1994. Consequently, much of the recent growth in academic R&D performance is attributable to increased funding from non-Federal sources, the industrial sector in particular (chart 12).

Between 1985 and 1994 total R&D performance by universities and colleges—exclusive of FFRDCs—increased an estimated 59 percent in real terms. Federally financed academic R&D ($12.2 billion in 1994) was up 51 percent, and university and college R&D performance using non-Federal funds ($8.3 billion) grew by 72 percent. The links between academic institutions and industry expanded considerably. Industry's academic R&D funding increased by 95 percent in real terms from 1985 to 1994, although it accounts for just 7 percent ($1.5 billion) of academia's 1994 R&D total. Universities' own institutional funds—the largest non-Federal source—are 70 percent higher in real terms and accounted for 18 percent ($3.7 billion) of their separately budgeted 1994 R&D expenditure total. Real R&D funds from State and local governments increased by 65 percent over this 9-year period and constitute 8 percent ($1.7 billion) of universities' 1994 R&D total.

ACADEMICALLY ADMINISTERED FFRDCs

R&D performance in 1994 by university-administered FFRDCs is estimated at $5.1 billion, or about 3 percent of the national R&D effort. These FFRDCs account for one-fifth of total estimated 1994 academic (universities and colleges plus academically administered FFRDCs) R&D performance. Academic R&D accounted for an estimated $26 billion, or 15 percent of the Nation's 1994 R&D performance.

By field, engineering accounted for about 34 percent of the university FFRDC funding total, and physical science R&D was 38 percent. Within universities and colleges, engineering and the physical sciences accounted for 16 and 11 percent, respectively, of R&D performance. Life sciences accounted for 54 percent of universities' R&D total but a considerably smaller share (4 percent) of the university FFRDC R&D (tables B-34 and B-36).

From 1974 to 1980 academically administered FFRDCs increased their R&D performance by almost 60 percent in real terms. This increase largely mirrored the Federal emphasis on energy programs. Since 1980 the Federal shift from energy to defense has resulted in much slower growth in FFRDC R&D performance—a 28-percent gain in real terms, or about one-half the growth in more than twice the time. Indeed, after adjusting for inflation, estimated FFRDC R&D performance has been virtually level since the mid-1980s.

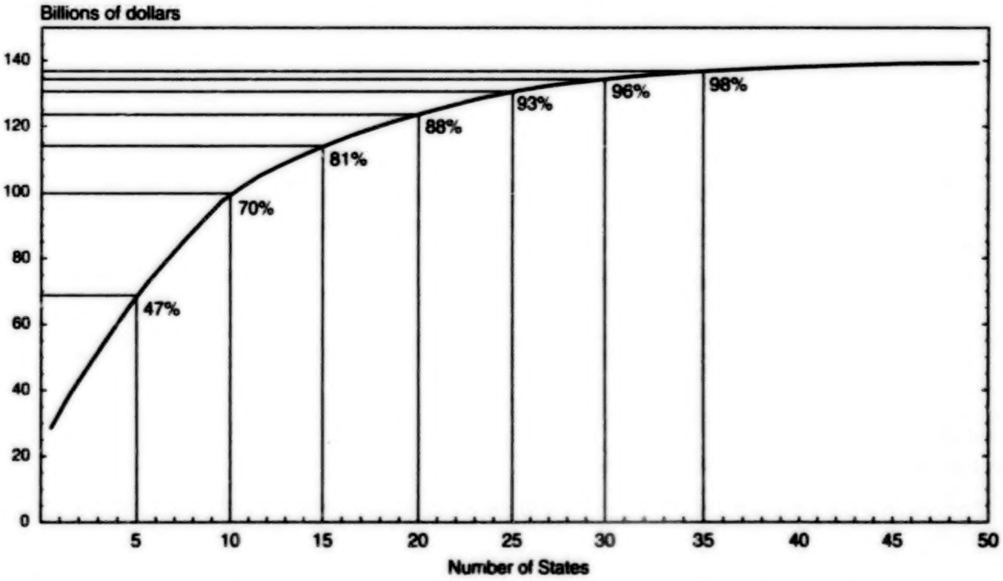
NATIONAL R&D PERFORMANCE PATTERNS—BY STATE

The latest data available on the State distribution of R&D expenditures are for 1991.[14] These data cover R&D performance by industry, academia, and Federal agencies, and the federally funded R&D activities of nonprofit institutions.[15]

The State distribution of R&D performance is highly concentrated (chart 13). Of the total U.S. R&D dollars spent and allocated by State in 1991 ($139 billion), more than one-half was spent in six States (California, New York, Michigan, New Jersey, Massachusetts, and Pennsylvania).[16] Moreover, about 70 percent of the national R&D effort was performed in 10 States—the preceding 6 together with Texas, Illinois, Ohio, and Maryland. Performance in California alone reached $28 billion. R&D expenditures ranged between $5 billion and $11 billion in each of the other nine leading States. R&D performance in each of the next 15 States totaled more than $1 billion; when combined with the first 10 States,

Chart 13

Cumulative distribution of R&D performance, by State: 1991



NOTE: Excludes R&D performance in the District of Columbia and R&D expenditures that cannot be distributed by State.

SOURCE: National Science Foundation/SRS; table B-17

they collectively accounted for 93 percent of the Nation's State-distributed R&D in 1991.

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[14] Although annual data are available on the location of R&D performance by the academic and Federal sectors, NSF conducts surveys on the State distribution of industrial R&D performance only in odd-numbered years. At this writing, the 1993 industry R&D survey data have not been processed, making 1991 the most recent year for which the State-specific R&D totals can be reported.

[15] R&D performance data include that conducted by FFRDCs in each sector of the economy. For a more detailed description of these data, as well as comparisons of 1985 R&D expenditures with other economic measures (for example, population and gross state product), see NSF, *Geographic Patterns: R&D in the United States,* NSF 89-317 (Washington, DC, 1989).

[16] Unless otherwise noted, these percentage distributions are based only on expenditures that could be distributed among the States. Excluded from the $160 billion 1991 national total are $2 billion of R&D performed in Washington, DC, and an undistributed component of $19 billion, which primarily resulted from a change in the sampling design used for collecting industry's R&D performance (table B-17). See the technical notes for information on this change.

Each of the 10 States that ranked highest in terms of 1991 R&D performance was also among the top 10 in 1975, although the order of their ranking has shifted somewhat. The largest three (California, New York, and Michigan) were unchanged from 1975. Pennsylvania was ranked fourth in 1975 but sixth in 1991. The ranking for Texas moved most during this period, increasing from 10th to 7th.

Not coincidentally, most of the States that are national leaders in total R&D performance are also leading R&D performers in one or more economic sectors (table 4). For example, of the 10 States that led in total 1991 R&D performance—

- Nine of the ten also ranked among the top 10 industrial performers, which, absent Maryland, included Washington State;
- Nine of the ten also ranked among the top 10 academic performers, which, absent New Jersey, included North Carolina; and
- Seven of the ten also ranked among the top 10 Federal performers, with New York, Michigan, and Illinois being absent.

These State rankings are somewhat different when the R&D expenditures are normalized by size of State. Just as the ratio of R&D expenditures to GDP is used to gauge a country's commitment to R&D, the ratio of in-State R&D performance to gross state product (GSP) can be used to measure the R&D intensity of a State's economy. For example, the largest R&D/GSP ratio was achieved in New Mexico (8.5 percent) even though the State ranked 14th, in terms of total R&D performance. The high research intensity of New Mexico's economy stemmed primarily from the considerable Federal support provided to the several FFRDCs in the State. On the other hand, California and New York led the Nation in terms of total R&D performance but were 7th and 14th, respectively, in terms of their R&D/GSP ratios.

Table 4.

States leading in R&D performance by sector and R&D as a percentage of gross state product: 1991

		Largest 10 performers (ranked by size of R&D in sector)				R&D intensity of State economy		
Rank	Total R&D [1] (in millions)	Total	Industry	Universities & colleges [2]	Federal Government [3]	Largest 10 [4]	R&D/GSP	GSP (in billions)
1	$28,337	California	California	California	Maryland	New Mexico	8.5	$30.3
2	10,363	New York	New York	New York	California	Massachusetts	5.5	156.1
3	8,851	Michigan	Michigan	Texas	Virginia	Maryland	5.2	111.9
4	8,768	New Jersey	New Jersey	Maryland	Alabama	Michigan	4.7	189.4
5	8,561	Massachusetts	Massachusetts	Massachusetts	Ohio	Delaware	4.3–4.9	21.3
6	7,621	Pennsylvania	Pennsylvania	Pennsylvania	Florida	New Jersey	4.1	212.8
7	6,635	Texas	Illinois	Illinois	New Jersey	California	3.7	763.6
8	6,417	Illinois	Texas	Michigan	Texas	Washington	3.3	119.0
9	5,975	Ohio	Ohio	Ohio	New Mexico	Colorado	3.2–4.3	76.9
10	5,864	Maryland	Washington	North Carolina	Pennsylvania	Pennsylvania	3.0	254.5

[1] Includes in-state R&D performance of industry, universities, associated federally funded research and development centers (FFRDCs), and Federal agencies and the federally funded R&D performance of nonprofit institutions.

[2] Excludes R&D activities of university-administered FFRDCs located within these states.

[3] Excludes R&D activities of all FFRDCs located within these states.

[4] The amount of R&D performed in Idaho is unknown because R&D performance data for industry are unavailable for 1991. Based on data from previous years, Idaho's 1991 R&D/GSP ratio may be as high as 5.6%. R&D/GSP ranges are provided for Delaware and Colorado because the exact amounts of industry R&D performance are unavailable.

KEY: GSP = gross state product

NOTES: Excludes R&D performance in the District of Columbia and R&D expenditures undistributed by state. States not listed had in-state R&D performance of less than $4 billion or an R&D/GSP ratio of less than 3.0 percent.

SOURCES: National Science Foundation/SRS, table B-17, and Bureau of Economic Analysis

CHARACTER OF WORK

The Nation spent an estimated $31 billion on basic research in 1994, $41 billion on applied research, and $100 billion on development (chart 14). These totals represent increases from estimated 1993 levels of 2 percent for basic research (unchanged in real terms); 2 percent for applied research (a decline of 1 percent in real terms); and 1 percent for development (a decline of 2 percent in real terms). As a percentage of all 1994 estimated R&D expenditures, these figures represent an 18-percent share for basic research, 24 percent of total for applied research, and 58 percent of total for development.

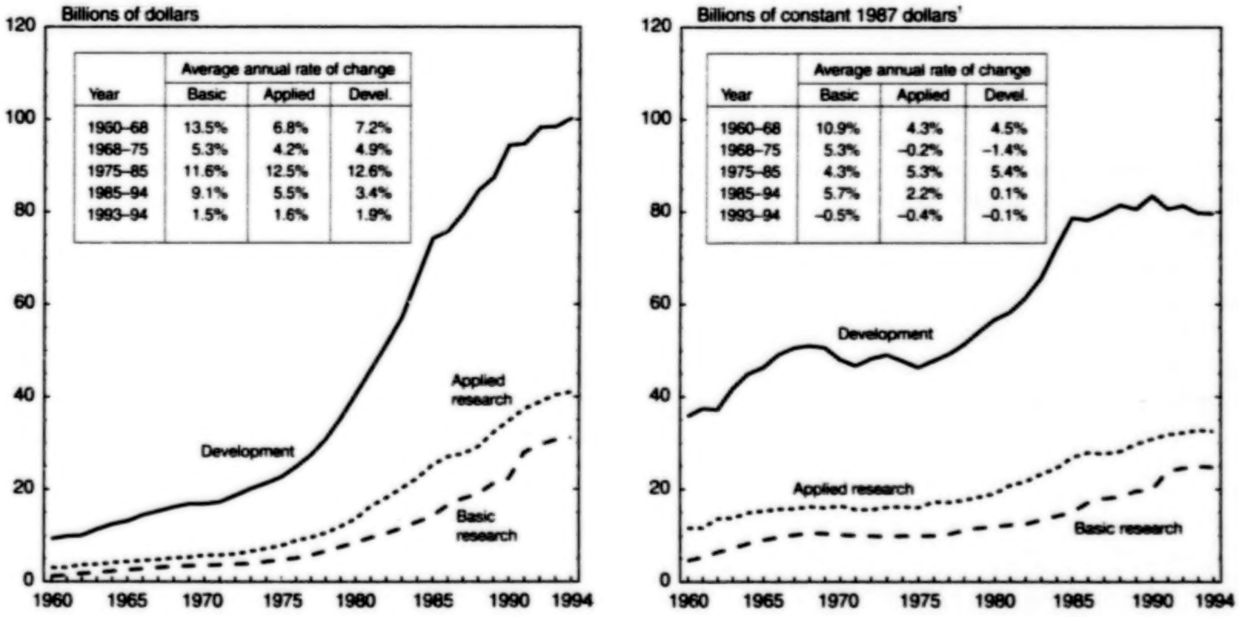
The 1994 percentage shares differ somewhat from those reported for 1980. Basic and applied research then accounted for smaller shares—13 and 22 percent, respectively—of R&D total, and development, for a slightly larger share—65 percent. The methodology for imputing character-of-work estimates for industry's R&D performance, however, was changed for 1986 and later years. The revised approach resulted in relatively higher estimates for basic and applied research and lower estimates for development expenditures. Consequently, data after 1985 are not strictly comparable with data for 1985 and earlier years. (See appendix A for further details.)

BASIC RESEARCH

The average annual growth in basic research spending between 1986 and 1994 is estimated at 8.2 percent. After adjusting for inflation, this growth

Chart 14

National R&D spending, by character of work



Year	Average annual rate of change		
	Basic	Applied	Devel.
1960–68	13.5%	6.8%	7.2%
1968–75	5.3%	4.2%	4.9%
1975–85	11.6%	12.5%	12.6%
1985–94	9.1%	5.5%	3.4%
1993–94	1.5%	1.6%	1.9%

Year	Average annual rate of change		
	Basic	Applied	Devel.
1960–68	10.9%	4.3%	4.5%
1968–75	5.3%	–0.2%	–1.4%
1975–85	4.3%	5.3%	5.4%
1985–94	5.7%	2.2%	0.1%
1993–94	–0.5%	–0.4%	–0.1%

¹Based on GDP implicit price deflator.

NOTES: Imputation methodology was changed for industry after 1985. See appendix A. Data are estimated for 1993 and 1994.

SOURCE: National Science Foundation/SRS; tables B-6, B-9, and B-12 represents an annual increase of 4.7 percent per year, which is consistent with the 4.8-percent real rate of growth reported for 1980 to 1985.

In terms of *support*, the Federal Government provides the majority of funds used for basic research. Yet despite the emphasis placed on basic research by recent administrations, the Federal share of the national basic research total dropped from 70 percent in 1980 to an estimated 58 percent ($18 billion) in 1994. This decline does not indicate a diminution in Federal support for basic research (in fact, it is up 73 percent in real terms since 1980) but instead reflects the growing tendency for such support to come from other sectors (up 192 percent over the 14-year period).

In terms of *performance*, universities and colleges account for the largest share (44 percent) of the basic research total. When the performance of university-administered FFRDCs is included, the academic sector's share of total climbs to 53 percent. In 1994 the basic research performance of universities—excluding FFRDCs—reached $14 billion, representing a 3-percent increase from 1993 (1 percent in real terms). The Federal Government—primarily the National Institutes of Health and NSF—provided an estimated 63 percent of the basic research funds used by the academic sector in 1994. Non-Federal sources, including industry and State governments, provided the remaining 37 percent of the total.

APPLIED RESEARCH

Over the 1986–94 period, national applied research spending grew at an estimated average annual rate of 5.3 percent, or 2.0 percent in real terms. Increases in industrial support are responsible for most of this gain. Industry accounted for an estimated 58 percent ($19 billion) of the 1994 applied research total. Federal support accounted for 35 percent ($14 billion) of the Nation's support for applied research. During the eighties, Federal support for applied research was intentionally deemphasized in favor of support for basic research. Even with the current administration's push to increase its support of generic/precompetitive applied research, Federal expenditures for applied research are only four-fifths those for basic research ($14 billion vs. $18 billion).

Sixty-nine percent ($28 billion) of the Nation's applied research was performed within industrial laboratories. Non-Federal sources accounted for most ($23 billion) of these monies; Federal sources provided the rest of the funds ($5 billion) for industry's estimated 1994 applied research performance.

Of the Nation's nonindustrial 1994 applied research performance, most was conducted by universities and colleges ($5 billion) and the Federal Government ($5 billion). About one-quarter of the Federal intramural applied research total was performed in DOD's labs, and about one-fifth of the total was performed within each of NASA's and the Department of Health and Human Services' labs. Total Federal applied research performance has been remarkably level over the past 30 years. After adjusting for inflation, expenditures have annually ranged between $3.2 billion and $4.1 billion since 1964.

DEVELOPMENT

The Nation's annual support for development has changed little since the mid-1980s. From 1980 to 1985 development grew on average by 6.8 percent per year in real terms as increasingly larger shares of the national R&D effort were directed toward defense R&D, which is 90 percent development. Between 1986 and 1994 the estimated average annual real growth rate subsequently fell to less than 1 percent, climbing from $78 billion to $83 billion (constant 1987 dollars) before settling back to $80 billion in 1994. Growth in both industry's and the Federal Government's development support slowed considerably, the latter reflecting the fiscal constraints placed on overall defense spending. Of 1994 national spending on development, industry provided 70 percent of the total and the Federal Government, 29 percent.

In terms of performance, industry is estimated to have accounted for 85 percent ($86 billion) of the Nation's 1994 development activities. Federal intramural activities account for practically all ($10 billion, or 9 percent of total) of the rest.

R&D SCIENTISTS AND ENGINEERS

NSF sponsors a variety of surveys designed to collect data on the human resources devoted to science and technology in the United States, including information on worker inputs for R&D. Surveys directed at *employers or institutions* focus on the amount of time devoted to the performance and management of R&D. These data are reported in terms of person-years, or full-time-equivalent (FTE) R&D jobs. Surveys directed at *individuals* collect data on self-reported primary work activity; that is, the activity on which a scientist/engineer spends the largest proportion of time but that is not necessarily full time. This *National Patterns* is the first to include revised estimates of the total number of scientists and engineers (S&Es) engaged primarily in R&D activities. The national totals include an FTE count of S&Es employed by industry, the total number of Federal employees whose primary work activity is research or development, an FTE estimate of graduate students' research activity, and the number of doctorate-holding S&Es working in educational or nonprofit organizations who self-report their primary work activity as research, development, or the management of R&D work. These concepts are further described in appendix A.

NATIONAL ESTIMATES OF R&D SCIENTISTS AND ENGINEERS

An estimated 960,500 scientists and engineers were employed in 1991 on R&D activities in the United States. This figure represented an increase of about 4 percent from the 1989 estimated level of 924,200. It was a 20-percent increase over the 1985 figure of 801,900, the first year for which revised national tabulations are derived (table B-16).[17] In 1991, industry employed 81 percent of these R&D personnel. Companies classified in the transportation industry accounted for the single largest industry share (19 percent of the industry 776,400 total), although the combined share of all nonmanufacturing industries (24 percent of industry's 1991 total) has been rising steadily. The Federal Government employed 6 percent (58,300) of the Nation's R&D S&Es in 1991, and the academic and nonprofit sectors accounted for the rest. Although the sector-specific survey methodologies differ considerably, the data indicate that a larger share of Federal R&D S&Es were employed in development activities (57 percent) than the share of academic R&D S&Es who were primarily engaged in research (93 percent of these doctoral R&D personnel).

Throughout the mid-1970s, there were approximately 55 R&D scientists/engineers for every 10,000 people in the labor force (table B-19). Continued increases in national R&D funding caused this ratio to climb annually through the 1980s, before settling to the current proportion of about 76 per 10,000.

These personnel estimates make it possible to gain a rough perspective on the changing cost of doing research. In 1991 the Nation spent an average of about $167,000 on R&D per R&D scientist and engineer. R&D expenditures include salaries, fringe benefits, materials, supplies, and overhead. The comparable 1985 R&D expenditure/R&D personnel ratio was about $142,000 per person. In constant 1987 dollars the 1985 and 1991 ratios were about $150,000 and $142,000, respectively. (See table B-33 for industry-specific ratios.)

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[17] Reported in the previous *National Patterns* were an estimated 841,600 FTE R&D S&Es in 1985 and 949,300 in 1989. The primary reason for differences in the national totals between the past and current reports is that previous series incorporated estimated FTE

[17]—Continued—figures for the academic and nonprofit sectors; the revised current series reports for those sectors the number of doctoral S&Es engaged primarily in R&D. See appendix A for details on the FTE R&D scientists and engineers series.

SURVEYS OF DOCTORAL SCIENTISTS AND ENGINEERS

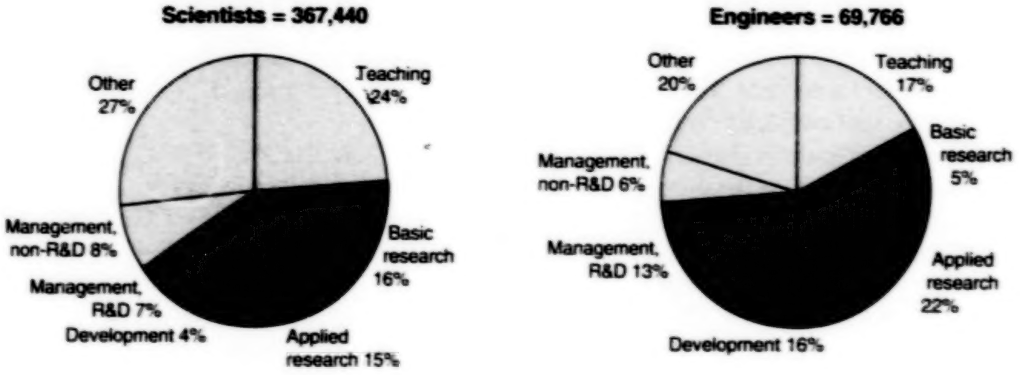
In 1991, the latest year of available data, there were approximately 437,200 doctoral scientists and engineers employed in the United States (table B-18). This total represented a 27-percent increase over the 344,000 reported for 1981. Employment of scientists with doctorates outnumbered doctoral engineers by 5 to 1 in 1991, 367,400 and 69,800, respectively.

Many of these doctorate-holders reported R&D as their primary work activity. Specifically, basic research accounted for 14 percent of the 1991 work total; applied research accounted for 16 percent; development, 6 percent; and R&D management, 8 percent. Teaching accounted for 23 percent of their primary work activities; the remaining 34 percent was distributed among non-R&D management, consulting, production, and other activities.

As a percentage of the individual totals, scientists (16 percent) were more likely to be engaged in basic research activities than were engineers (5 percent), and engineers (39 percent) were more often employed in applied research and development than were scientists (19 percent). Engineers also more often reported being employed in R&D management (13 percent) than did scientists (7 percent). Overall, a relatively larger share (57 percent) of doctoral engineers reported R&D or R&D management as their primary work activity than did doctorate-holding scientists (41 percent) (chart 15).

Chart 15

Employed doctoral scientists and engineers, by primary work activity: 1991



SOURCE: National Science Foundation/SRS; table B-18

APPENDIXES

A. Technical Notes and Tables

B. Detailed Statistical Tables

APPENDIX A
TECHNICAL NOTES

BASIS FOR SECTOR CLASSIFICATION

The National Science Foundation (NSF) follows a four-sector division in reporting research and development (R&D) funds and personnel and maintaining time-series data on expenditures and employment. The sectors are (1) industry, (2) the Federal Government, (3) universities and colleges, and (4) other nonprofit organizations. They are described in more detail below. Data also are collected for Federally Funded Research and Development Centers (FFRDCs), which are organizations exclusively or substantially financed by the Federal Government to meet a particular requirement or to provide major facilities for research and associated training purposes. Each center is administered either by an industrial firm, an individual university, a university consortium, or a nonprofit institution.

Federal Government. This sector consists of the agencies of the Federal Government.

Industry. This sector consists of both manufacturing and nonmanufacturing companies. Manufacturing companies are reported by major industry groupings. Nonmanufacturing companies include those in mining, construction, transportation, communications, and selected service industries, such as R&D laboratories and computer and data processing services. Performance of FFRDCs administered by industrial firms is included in industry totals, although FFRDC breakouts are available. Industry's funding of industry R&D includes all funds received from non-Federal sources (e.g., from State and local governments).

Universities and Colleges. This sector consists of all institutions of higher education, both public and private. Expenditures of FFRDCs administered by universities and colleges are reported separately from totals for this sector. University funding of university R&D includes (1) State and local government funds separately budgeted for R&D and (2) restricted or general funds that the institutions themselves have been free to allocate for research. Funds from the Federal Government, industry, or other nonprofit institutions, which are supplied in the form of grants or contracts for R&D at a university, are credited to the appropriate source. For example, research contracts from industry are treated as university performance funded by industry. Funds given to the institution by industry for general educational purposes and used by the school—at its discretion—for research are treated as university performance financed with the university's own funds.

Other Nonprofit Institutions. This sector consists of institutions that fall into two general groups: (1) organizations that are primarily granting in nature—i.e., private philanthropic foundations and voluntary health agencies; and (2) public and private organizations involved in performing R&D, including FFRDCs administered by nonprofit organizations.

DEFINITIONS

Research and Development. In this report R&D consists of basic and applied research in the sciences (including medical sciences) and in engineering and activities in development, all defined below.

The Federal, university, and nonprofit sectors include data for the broad fields of physical sciences, environmental sciences, mathematical sciences, computer sciences, life sciences, psychology, social sciences, an all-inclusive "other sciences" category, and engineering. Industry coverage is limited to (1) the physical sciences, including related engineering and (2) the biological sciences, including medicine but excluding psychology. Industry R&D specifically excludes research in the social sciences.

Basic Research. Within the Federal, university, and nonprofit sectors, basic research is defined as research directed toward increases in knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific application toward processes or products in mind. For the industry sector, basic research projects are defined as "original investigations for the advancement of scientific knowledge…which do not have specific commercial objectives, although they may be in fields of present or potential interest to the reporting company."

Applied Research. Within the Federal, university, and nonprofit sectors, applied research is defined as research directed toward gaining "…knowledge or understanding necessary for determining the means by which a recognized and specific need may be met." The applied research definition for the industry sector is modified to include "…research projects which represent investigations directed to discovery of new scientific knowledge and which have specific commercial objectives with respect to either products or processes."

Development. The NSF survey definition of development is "…the systematic use of the knowledge or understanding gained from research directed toward the production of useful materials, devices, systems or methods, including design and development of prototypes and processes." It excludes quality control, routine product testing, and production.

CURRENT OPERATING COSTS

Funds used for R&D refer to current operating costs. These costs consist of both direct and indirect costs. They include not only salaries, but also fringe benefits, materials, supplies, and overhead. The R&D costs include depreciation, insofar as this information is available to respondents. Capital expenditures are excluded by definition in the surveys of the industry and academic sectors. Under the accounting practices of some Federal agencies, obligations for capital items may be included.

For universities and colleges, R&D data are for separately budgeted expenditures only. Consequently, these data exclude that portion of salaries for research time or other research expenses financed by funds not specifically earmarked for R&D from State and local governments and other non-Federal sources, including endowments.

PERFORMER REPORTING BASIS

There is no single survey of R&D activity in the United States. Rather, NSF sponsors a series of surveys to collect data on the financial and human resources devoted to R&D in the various sectors of the U.S. economy (defined above). Although these surveys are not designed specifically for this purpose, they provide the primary source material for estimating the national R&D totals. Respondents indicate the amounts they spend on R&D in their own sector and, generally, the sources of these funds. To the greatest extent possible, national totals are based on data as reported by performers because they are in the best position to (1) indicate how much they spent in the actual conduct of R&D in a given year; (2) classify their work as basic, applied, etc.; and (3) identify the sector of the economy in which their financing originated. For those reasons, and because the consistent use of performer reporting reduces the possibility of double-counting and conforms to international standards (as outlined by the Organisation for Economic Co-operation and Development), R&D data are presented on a performer basis whenever possible.

Separate R&D performance totals are reported for (1) the Federal Government, (2) industry, (3) universities and colleges, (4) university-administered FFRDCs, and (5) other nonprofit organizations. R&D performed by State and local government agencies is not included in the national R&D totals. When State and local governments are listed by a survey respondent as the source of non-Federal R&D funds, those amounts are included in the source totals of the sector reporting the R&D performance.

The remainder of this section and the next section, "Estimating Procedure for 1993 and 1994," outline the approaches and assumptions used for deriving the national totals. The procedures for estimating R&D expenditures by performer and source for the years 1990 through 1994 are further summarized in table A-5. The structure of the table is the same as those of tables B-2, B-5, B-8, and B-11, in which the expenditure totals are detailed.

Federal Government

Federal agency R&D obligations for intramural performance are treated as the equivalent of R&D expenditures in the *National Patterns* series. As detailed in the *Federal Funds for Research and Development* series *(Federal Funds)*, such intramural activities cover costs associated with the planning and administration by Federal personnel of intramural and extramural R&D programs as well as actual intramural R&D performance. (See NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1992, 1993, and 1994*, Detailed

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Statistical Tables, NSF 94-328.) In general, the universe of Federal agencies with R&D programs has been surveyed annually since 1953 for their R&D performance and since 1963 for the distribution by character of work. The most recent survey included R&D funding as reported by 103 Federal agencies or their subdivisions.

In addition to Federal obligation data, *National Patterns* uses data on Federal R&D budget authority and outlays. The use of each series is clearly noted in the text.

- *Budget authority* is the primary source of legal authorization to enter into financial obligations that will result in outlays. Budget authority most commonly is granted in the form of appropriations laws enacted by Congress with the approval of the President. [See Federal R&D Funding by Budget Function: Fiscal Years 1993–95 (Budget Function), NSF 94-319.]

- *Obligations* represent the amounts for orders placed, contracts awarded, services received, and similar transactions during a given period, regardless of when the funds were appropriated and when future payment of money is required.

- *Outlays* represent the amounts for checks issued and cash payments made during a given period, regardless of when the funds were appropriated or obligated.

Industry

In general, the industry sector has been surveyed annually since 1953 for its total R&D performance and since 1956 for the distribution by character of work. The U.S. Bureau of the Census conducts the survey for NSF. The target population of the survey is companies, whether U.S. or foreign owned, that perform R&D in the United States. Prior to the 1992 survey with the introduction of annual sampling, a new sample was drawn and canvassed only every 5 or 6 years (for example, in 1976, 1981, and 1987). In the intervening years, a subset of the last sample—called a panel and including all companies reporting more than $1 million in R&D—was surveyed. Accordingly, data for the years in which a sample was not drawn did not include companies that were new entrants in the R&D field, and such data were generally biased in a downward direction. The Census Bureau, however, did estimate the annual changes in R&D data for companies that reported R&D in the sample year but were not included in the panel. As new samples were drawn, revisions to previous years' estimates were issued—a process called "wedging."

For example, a new sample was drawn for 1987, from which R&D data were collected for 1986 as well as 1987. Data from the new sample were used by Census to revise 1986 R&D performance estimates. The new 1986 data were also used by Census in combination with data from the last sample year, 1981, to revise estimates for the intervening years. NSF subsequently provided a second round of revisions to the 1982–85 R&D series. In both cases the revisions were done on an industry basis: an effort was made to apply the overall 1981–86 growth rates while preserving the relative year-to-year movements in each industry's R&D. This approach resulted in major revisions of the 1982–87 industry R&D time series previously published in *National Patterns*, especially of the nonfederally funded component of industry's R&D performance. The revised totals, as well as the industry data reported in *National Patterns*: 1990 (NSF 90-316), are presented in table A-1. (Some of these data have since been revised, but the revisions were unrelated to the drawing of a new sample.)[18] Details on survey methods, coverage, concepts, definitions, and reliability of the estimates associated with the R&D expenditure data are contained in the 1990 edition (NSF 94-304) of the *Research and Development in Industry* series (*Industry R&D*).

Sample Design Revision for 1992

This *National Patterns* is the first to include revised R&D data based on a new industry sample drawn for the 1992 survey year. Data for 1991 were also collected. For the 1987 survey, about 14,000 firms were selected for the sample. For years 1988 through 1991, a panel of approximately 1,700 companies were selected from the 1987 sample and were annually resurveyed. These companies accounted for approximately 90 percent of total industry-performed R&D. Other companies in the 1987 sample did not receive another questionnaire, but their R&D data were estimated. Beginning with the 1992 survey, NSF will draw new samples annually, and the sample size is increased to 23,000 firms. The new sample better reflects the widening population of R&D performers among firms in the nonmanufacturing industries and small firms in all industries. As a result, extensive revisions were made in the historical industry and national R&D time series.

The revised 1991 industry R&D performance ($117 billion) is 14 percent higher than was previously reported

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[18] Note that although Census reestimated 1982–86 R&D totals by funding source, it did not provide a character-of-work distribution for the revised data. After investigating several possible alternatives, NSF chose to allocate the revisions (table A-1) on the basis of average character-of-work distribution published in earlier annual Industry R&D reports. Allocations for the federally funded and nonfederally funded R&D revisions were applied separately.

($102.2 billion). Of the $14.7 billion revision, $13.7 billion resulted from the new sample and $1.0 billion from normal data revisions for firms sampled in both surveys. Furthermore, $11.4 billion of the $13.7 billion increase stemming from the enlarged sample design was reported for nonmanufacturing industries, including $2.0 billion of R&D in industries not previously included in the sample frame. The revised U.S. 1991 R&D total ($160.2 billion) incorporating the new industry sample is 10 percent higher than the U.S. performance total ($145.4 billion) based on previous industry R&D estimates. Complete technical details on industry's new survey methodology are contained in the forthcoming report, *Research and Development in Industry: 1992.*

Like in previous sampling cycles, this *National Patterns* includes revisions to the industry data for years intervening the 2 sample years, (i.e., for 1988, 1989, and 1990). The industry and U.S. time series reported here include the wedged data reported for 1988–90 and the revised data for 1991–92. Since these 1991 data were collected at the same time as the 1992 data, the year-to-year changes reported for 1991–92 are not affected by changes in the survey sampling design. For almost all of the aggregate statistics (for example, industry R&D by Federal and non-Federal sources of funding), NSF believes that time series comparisons (for example, between 1981 and 1992 data) are still reasonable: Surveys undertaken in both years provided the best estimates of the Nation's industrial R&D performance total by sampling those industries then believed to be conducting R&D. However, wedging does not fully correct all changes in the survey series; comparisons between some data elements for consecutive years may be problematic.

Not only do the 1987 and 1992 surveys' sample size and frame differ considerably (see above), but $9.2 billion of R&D performed by firms reporting in both surveys was shifted from one industry in 1987 to another in 1992—especially from manufacturing industries in 1987 to nonmanufacturing industries in 1992. Such classification shifts can be attributed to (1) product mix changes of individual firms that occurred some time during 1987–92, (2) changes in the 1987 SIC that were effected in the 1992 survey, and (3) a change in the methodology used by NSF/Census for classifying companies to specific 2- and 3-digit SIC industries. Wedging smoothes the industry totals over time, but does not pinpoint the actual year of change.

Appendix table A-2 provides summary statistics for wedged data that appear in this *National Patterns* with those that were previously published. For example, the 1990 R&D/GDP ratio is 2.64 percent using the original 1990 industry survey data, but this ratio is 2.73 percent based on the use of wedged data. For 1991, the R&D/GDP ratio is 2.80 percent. The wedged R&D time series smoothes the year-to-year changes between the 1987 and revised 1991 survey endpoints. Since NSF is now committed to drawing new samples annually, the issue of wedging is unlikely to recur.

Character-of-Work Revisions

As noted in the *National Patterns of R&D Resources: 1992*, the procedures used by Census for imputing character-of-work splits for industry's R&D performance were changed for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. A full description of the various imputation methodologies—and alternatives—is presented in the 1988 *Industry R&D* report (NSF 90-319). Briefly, for 1985 and earlier, for companies that did not report character-of-work splits, Census imputed the splits based on either (1) the company's percentage distribution reported in its most recent year of available data or (2) in the absence of any prior year breakdown for the company, the average character-of-work split for the industry to which the company was assigned. For years after 1985 Census does not impute a company's character-of-work distribution unless the company has reported a breakout within 2 years of the year being imputed. When distributions are not imputed, Census assigns the company's R&D to an "undistributed residual" category. (For example, and as detailed in table A–3, industry reported $96.7 billion in 1992 R&D performance with non-Federal funds; of that, Census did not distribute $16.4 billion.)

To provide character-of-work estimates for the entire population of firms performing R&D in the United States, each industry's (as contrasted with each individual company's) "undistributed residual" is allocated to basic research, applied research, and development categories using the average character-of-work splits reported for that industry. This approach resulted in relatively higher performance shares for basic and applied research than had been previously estimated and relatively lower estimates for development's share of industry's total R&D performance (table A-3). See the forthcoming report, *Research and Development in Industry: 1992* for further discussion of this issue.

Universities and Colleges

The academic sector, including all university-administered FFRDCs, has been surveyed annually since 1972 for R&D performance. It was surveyed less frequently before 1972. For 1992, data were collected from a sample of the 594 institutions of higher education in the United States and outlying areas that (1) granted a graduate degree in science or engineering and/or (2) performed activities for which at least $50,000 had been funded from separately budgeted R&D expenditures. The 461 institutions sampled comprised all doctorate-granting institutions, all historically black colleges and universities with any R&D expenditures, and a random sample of all other institutions. For 1983–87 and 1989–91, R&D performance was estimated from a census of institutions that granted doctorates in science and engineering plus a sample of all other universities and colleges. For 1988, data were collected from the full population of 556 institutions that met the criteria listed above.

With the exception of 1978, data on the basic research performance of universities and colleges and of university-administered FFRDCs have been collected annually since 1972. Since 1979, however, only the combined total for applied research and development performance has been collected. Furthermore, data on the character of work from individual non-Federal sources of funds (i.e., industry, institutional funds, State and local governments, and other sources) are not surveyed. For the years 1978 to the present, the distribution of applied research and development from Federal sources is based largely on data from Federal Funds; the development split from *each* of the non-Federal funding sources is estimated at 7 percent of the surveyed non-Federal R&D funding totals; and the applied research share from *each* of the non-Federal funding sources is an estimated residual (total R&D funds, minus basic research funds, minus development funds).

Revised estimates for Federal funding of applied research and development to universities and colleges and to university-administered FFRDCs were first included in the *National Patterns of R&D Resources: 1992*. University performers report the amount of R&D and basic research that they undertake with Federal funds. The residual is their combined applied research and development performance. The distribution between applied research and development is estimated from the percentage shares of Federal obligation data to the academic sector as reported by Federal agencies in *Federal Funds*.

Although the estimating procedures used previously had been loosely based on the data provided by the Federal funding agencies, the approach adopted here formally links the performer- and source-reported survey data. Applied research and development expenditures for universities and colleges were revised for the period 1978-present; for university-administered FFRDCs, revisions were made back to 1975. The general result is that the applied research share is slightly lower and the development share somewhat higher than previously reported. For example, of the $9.0 billion in Federal R&D support to universities and colleges in 1989, $2.9 billion was for applied research and development and $6.1 billion was for basic research activities. In *National Patterns: 1990*, $2.5 billion (28 percent of all Federal funds to the sector) was estimated as applied research and $0.3 billion (3 percent) as development. In *National Patterns: 1992* and in this report, 1989 Federal applied research funds are estimated at $2.1 billion (24 percent) and development at $0.7 billion (8 percent). The revised totals, as well as the data reported in *National Patterns: 1990,* are presented in table A-4.

Only for the academic sector does R&D performance include research funds subcontracted to outside organizations. (For performance reported by respondents in the other surveyed sectors, R&D subcontracted to other organizations is excluded.) Details on survey methods, coverage, concepts, definitions, and reliability of the estimates associated with the R&D expenditure data are reported in the FY 1992 report (NSF 94-324) in the *Academic Science and Engineering: R&D Expenditures (Academic R&D)* series.

Other Nonprofit Institutions

It has not been possible to maintain the same survey frequency for other nonprofit institutions; the last complete survey was conducted in 1973. Since then, small and informal surveys of this sector have been undertaken periodically, most recently for 1983. For the years 1984 to the present, estimates for federally funded total R&D and character-of-work performance by nonprofit institutions—including associated FFRDCs—are derived from Federal obligation data reported in Federal Funds. Industry as a source of R&D funds to this sector is estimated from the average of the annual percentage change in (1) industry's funding of industry-performed R&D (from *Industry R&D*) and (2) industry funding of university-performed R&D (from *Academic R&D*). Nonprofit funding as a source of R&D funds to this sector is estimated from the annual percentage change in nonprofit funding of university-performed R&D (from *Academic R&D*). The character-of-work splits from the non-Federal funding sources that were surveyed in 1983 are carried forward to the present.

ESTIMATING PROCEDURE FOR 1993 AND 1994

To the greatest extent possible, this report incorporates data for 1993 and 1994 R&D programs that are presented in the administration's 1995 budget proposal. For example, the 1995 budget contains data on total R&D outlays and budget authority by agency and by character of work. However, the budget does not contain reliable estimates on the amount of Federal R&D funds received by each of the R&D-performing economic sectors, but only the federally funded totals and funds received by universities and colleges. The detailed sector-specific information is obtained from an NSF survey of Federal agencies' R&D obligations, which is collected after the President's proposed budget has been published. For this reason, some of the 1993 and 1994 Federal R&D data reported here are based on the administration's 1994 budget proposal.

R&D performance totals in *National Patterns* are estimated for each sector, by character of work, and by source of funds from surveys and time-series extrapolation techniques, as follows.

Federal Government

Estimates are based on changes in intramural R&D obligations reported in *Federal Funds. Federal Funds* 1994 data reflect congressional appropriations, apportionment, and reprogramming decisions as of the third quarter of fiscal year (FY) 1994.

Industry

Estimates are based on (1) time-series modeling for the Federal sector as a source of funds, supplemented by Federal obligations data reported in *Federal Funds* (NSF 94-328), and (2) a mail survey conducted by the independent Industrial Research Institute of R&D officials in the major R&D-performing industries. Responses were received from 158 members of IRI contacted in August 1993. The IRI, which annually conducts this survey, is an association of approximately 260 R&D-performing companies, with annual R&D expenditures ranging from around $1 million to over $6 billion. (Detailed results of the IRI survey may be found in *Research Technology Management*, vol. 37, No. 1, January–February 1994, pp. 15–17.) Previously, NSF had conducted its own survey of companies' planned R&D expenditures.

Universities and Colleges

Data for 1993 are actual R&D performance as reported by universities and college. Estimates for 1994 are based on (1) Federal obligations reported in *Federal Funds* (NSF 94-328 and unpublished updates) and (2) extrapolations of recent trends for each of the non-Federal sources.

Other Nonprofit Institutions

Estimates for 1994 are based on (1) Federal obligations reported in *Federal Funds* (NSF 94-328 and unpublished updates) and (2) extrapolations of recent trends in R&D performance and funding within the industry and university sectors, as outlined in the preceding section, "Performer Reporting Basis."

Sector Summary

Table A-5 provides a concise listing of sectors for which performer-reported data, source-reported data, or a combination of the two are used; the general approaches adopted (for example, regression or time-series techniques); and assumptions used in estimated national expenditures on R&D, basic research, applied research, and development, all of which are outlined above. The table includes such information for the current projection years (1993–94), for finalized data of recent years (1990–92), and for a historical reference year (1973).

USE OF TIME-SERIES DATA

Data presented in trend tables are assembled from the most recently completed survey cycles. Data for prior years are reviewed for consistency with current year's responses and—when necessary—revised in consultation with survey respondents. In addition, changes in sample design or imputation methodologies can result in revisions to previously published data. For trend comparisons, the historical data contained in this report should be used rather than the data published in previous *National Patterns* volumes.

DEFENSE-SPACE-CIVILIAN CLASSIFICATION

"Defense R&D" consists of R&D spending by the Department of Defense (DOD) and defense-related atomic energy programs of the Department of Energy. Except for those of the Army Corps of Engineers, all DOD activities are classified as defense, although some activities have secondary objectives (e.g., space). "Space R&D" consists of R&D spending by the National Aeronautics and Space Administration (NASA). All industry-funded R&D is classified as *civilian* R&D, including expenditures by aerospace and electronic industries.

This report contains data on (1) the estimated percentage distribution of total U.S. R&D performance by national objective (table B-14) and (2) the reported distribution of Federal R&D authority by budget function (table B-21). (See *Budget Function*.) The performer-based U.S. shares differ from the Federal budget authority shares for several reasons. The U.S. shares are based on expenditures reported by performers, who often expend Federal R&D funds in a year other than the one in which the Federal Government provided authorization, obligations, or outlays. In addition, the two series are based on slightly different concepts. For example, whereas in the U.S. series all of NASA's R&D funds are considered to be expenditures for space R&D, the budget authority data are distributed according to the functional categories that constitute the Federal budget. Thus, NASA's R&D budget authorizations are distributed between the space research and technology function and the transportation function.

GEOGRAPHIC DISTRIBUTION

This report contains information on the State distribution of R&D performance for 1991 (table B-17). These data cover R&D performance by industry, academia, Federal agencies, and the federally funded R&D activities of nonprofit institutions. The zero figures reported for some States in table B-18 represent R&D performance of less than $0.5 million. These State-distributed data are meant to be indicative of general distribution patterns; they are not necessarily precise.

The geographic data on 1987 R&D expenditures in *National Patterns: 1990* included State agencies' intramural R&D performance that was obtained from a special NSF survey, *Research and Development Expenditures of State Government Agencies: Fiscal Years 1987 and 1988* (NSF 90-309). The estimates for 1991 provided here do not include this State agency component.

State-distributed data for the industry sector are collected for odd-numbered years. The latest available detailed data are for 1991 and are from *Industry R&D* (NSF 94-325). The data include R&D performance by industry-administered FFRDCs.

State-distributed data for Federal laboratories are intramural R&D obligations in FY 1991. These data are available from the 10 major R&D-supporting agencies (*Federal Funds*).

State-distributed data for the academic sector are collected only for doctorate-granting institutions and university-administered FFRDCs (*Academic R&D*). R&D performance by an FFRDC is assigned to the State in which the FFRDC is located, which is not necessarily the State in which the administering institution is located.

State-distributed data for other nonprofit institutions are Federal R&D obligations to this sector in FY 1991 as reported by the 10 major R&D-supporting Government agencies (*Federal Funds*). These agencies provided more than 97 percent of total Federal R&D obligations in 1991. Data on R&D performance by this sector using non-Federal sources of funds are not collected.

HUMAN RESOURCES

This *National Patterns* is the first to include revised U.S. data on scientists and engineers (S&Es) engaged in R&D activities. The national series consists of separate survey estimates of R&D S&Es employed in industry and in the Federal Government and of doctorate-holding R&D S&Es employed in educational institutions and in nonprofit organizations. The industry series are for S&Es employed on a full-time equivalent basis (defined below). Totals for the other sectors reflect the primary work activity of S&Es.

A variety of surveys and estimation techniques are used to gather information on the numbers and characteristics of persons engaged in science and engineering activities in all sectors of the economy. In general, two types of surveys are used in reporting worker inputs for R&D: surveys directed at individuals and surveys directed at employers.

Surveys of Individuals

These surveys (in this report, of scientists and engineers holding doctorate degrees) result in data on the primary work activities and demographic and economic characteristics of the respondents. In the survey of doctoral scientists and engineers, respondents are asked to report their primary work activity—i.e., the activity on which they spend the largest proportion of their time, but that is not necessarily a full-time activity. This survey is conducted only in odd-numbered years. The latest tabulated data are available for 1991 and are summarized in table B-18. Details on survey methods, coverage, concepts, definitions, and reliability of the estimates associated with these S&E data are in *Characteristics of Doctoral Scientists and Engineers in the United States: 1991* (NSF 94-307).

Surveys of Employers

These surveys generally are focused on the amount of time—in terms of person-years—devoted to the performance and management of R&D. In this report, data on the number of S&Es—not just those holding doctoral degrees—employed by industry on an full-time-equivalent (FTE) basis in R&D are summarized in table B-32. For example, if each of two scientists/engineers spends 50 percent of the workday on R&D, the equivalent is one FTE R&D job.

Previously, the *National Patterns* provided national estimates of FTE R&D scientists and engineers. At one point, SRS had survey data for FTE estimates in all sectors of the economy. Currently, SRS collects such data only for the industrial sector. The last FTE R&D manpower survey of the academic sector was for 1985, and the last manpower survey of the nonprofit sector was for 1973, although a small telephone survey was conducted for 1983. The loss of such survey data had necessitated increased reliance on analytically derived figures (including the use of regression equations) that were based largely on estimating assumptions that could not be empirically tested for their continued validity. Consequently those estimated series are replaced here with survey counts of the number of doctorate-holding S&Es who self-report their primary work activity as R&D or R&D management. How well these head counts might approximate an FTE estimate is unknown. On the one hand, these head counts may provide an overestimate of FTE activity since many of the surveyed S&Es are not engaged in R&D full-time even though it is their primary work activity. On the other hand, this approach may underestimate FTE R&D personnel since it does not account for S&Es engaged in R&D who do not hold a doctorate degree. Sources for the revised estimates and comparison with the 1985 and 1989 figures published in *National Patterns: 1992*, are described and summarized in table A-6. For the total United States, the revised figures for 1989 (924,200) are 3 percent lower than previously reported (949,300).

Industry. This is the only sector for which FTE R&D S&E survey estimates are available. Firms report (*Industry R&D*) FTE employment levels for January of each year, and a simple 2-year moving average is used for the national R&D S&E series. For example, the total reported for 1989 (733,000) is the average of the level reported by firms for January 1989 and January 1990. Except for minor data revisions resulting from the inclusion of wedged statistics, the industry totals reported here do not differ from those reported previously. As detailed above for the industry expenditure data, improvements in the sample design for 1991 and later years resulted in data that now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

Federal Government. For the Federal sector, survey data on civilian scientists and engineers are collected annually (*Federal Scientists and Engineers*, NSF 89-322). The estimates are compiled from the U.S. Office of Personnel Management's (OPM's) Central Personnel Data File on all white collar civilian jobs and are reported in terms of primary work activities. Scientists or engineers are included in the *National Patterns* totals if their primary work activity is research or development. These head counts exclude (1) military personnel (but include civilian S&Es employed in defense agencies) and (2) Federal employees classified in a management occupational code, even if they manage an R&D program. The earliest year for which these OPM statistics have been compiled is 1985. Data for 1985–89 published in the previous *National Patterns* included estimates for R&D managers, which estimates are no longer included in the Federal totals. For years prior to 1985, the figures reported were based on NSF surveys since discontinued.

Universities and Colleges. For the academic sector two series are reported: doctoral scientists and engineers and graduate students doing research. The head counts for research students are from the *Survey of Graduate Students and Postdoctorates in Science and Engineering* and are for full-time science and engineering graduate students in all institutions whose major financial support is research assistantships. In this revised series FTE estimates are derived assuming a 50-percent workload (or working half-time on R&D), whereas previously a 47-percent workload assumption was used.

Academic institutions were previously surveyed for estimates of FTE R&D S&Es; however, 1985 is the most recent year for which this survey was conducted. Since then the academic estimates published in *National*

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Patterns were derived, usually, from a regression of the 1975–85 academic FTE survey data on (1) academic R&D expenditures and (2) the number of academic doctoral S&Es who reported R&D as their primary work activity. The revised series directly utilizes reported employment levels from the *Survey of Doctorate Recipients (SDR)*. The academic R&D employment totals are of doctoral scientists and engineers employed in all educational institutions who self-report their primary work activity as "research," "development or design," or the "management or administration of R&D." No adjustments are made to derive full-time equivalents. For 1989 the revised primary work activity total (83,500) is about 10 percent less than the FTE figure (93,700) last published in *National Patterns*. Since the doctoral data are collected only biennially, the revised national FTE series also are reported biennially.

NSF introduced a number of improvements into the 1991 SDR (for example, changes in the age-based cohorts collected and in the definition of doctoral scientists and engineers) that may affect comparability with SDR data published for prior survey years. The academic S&E total for those reporting R&D as their primary work activity for 1989 is 83,500 and the total for 1991 is 74,600. Whether changes in the survey design or in actual employment patterns caused the academic R&D S&E decline is unknown. Users should consult the report, *Characteristics of Doctoral Scientists and Engineers in the United States: 1991* (NSF 94-307) for more information on these methodological changes.

Other Nonprofit Institutions. The last survey of the nonprofit sector was for 1973. Since then the nonprofit estimates published in *National Patterns* generally were based on survey data from the early seventies and trends in the ratio of national R&D expenditures to FTE R&D S&Es. In the revised series nonprofit R&D employment levels are taken from the *Survey of Doctorate Recipients*. The figures are for doctoral scientists and engineers employed in nonprofit organizations who self-report their primary work activity as "research," "development or design," or the "management or administration of R&D." No adjustments are made to derive full-time equivalents. For 1989 the revised primary work activity total (9,200) is about 75 percent less than the FTE figure (34,500) last published in *National Patterns*. The effect on the Nation's total FTE estimate is about a 2.7-percent downward revision.

LIST OF SUPPORTING R&D EXPENDITURES DATA SOURCES

National Science Foundation, *Federal Funds for Research and Development: Fiscal Years 1992, 1993, and 1994*, NSF 94-328 (Arlington, VA, 1994). Detailed statistical tables cover R&D (and R&D plant) funding levels through August 1993 as reported by all Federal agencies with R&D programs. Includes data by agency, performer, character of work, geographic distribution, and field of science and engineering.

National Science Foundation, *Federal R&D Funding by Budget Function: Fiscal Years 1993–95*, NSF 94-319 (Arlington, VA, 1994). Provides information on Federal R&D budget authority by Federal budget function as proposed in the administration's 1995 budget.

Office of Management and Budget, *The Budget of the United States Government, Fiscal Year 1995* (Washington, DC: GPO, 1994). Provides quantitative and qualitative information on R&D funding as proposed in the administration's 1994 budget.

National Science Foundation, *Research and Development in Industry: 1991*, NSF 94-325 (Arlington, VA, 1994) and *Selected Data on Research and Development in Industry: 1992*, NSF 94-327 (Arlington, VA, 1995). Detailed statistical tables cover industrial R&D performance as reported in a sample survey of companies. Data include distribution by source of funds, industry classification, character of work, product field, geographic location, company size, and other tabulations.

"Industrial Research Institute's Annual R&D Trends Forecast," *Research Technology Management*, vol. 37, No. 1, January–February 1994, pp. 15–17. Provides a summary of expected 1994 industrial R&D activity, and includes information on changes related to companies' R&D budgets (such as participation in consortia and hiring patterns). Report is based on a mail survey of IRI membership in August 1993.

National Science Foundation, *Academic Science and Engineering: R&D Expenditures, Fiscal Year 1992*, NSF 94-324 (Arlington, VA, 1994). Detailed statistical tables cover academic R&D performance as reported in a survey of U.S. universities and university-administered FFRDCs. Data include distribution by source of funds, performing institution, character of work, field of science, and geographic location.

National Science Board, *Science & Engineering Indicators: 1993*, NSB 93-1 (Arlington, VA, 1994). Source of information on R&D and other science and engineering data. Published source of national R&D expenditures estimates for years when the biennial *National Patterns* report is not published.

APPENDIX A
TECHNICAL TABLES

TECHNICAL TABLES

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Table A–1.

Revisions in industry R&D performance totals: 1982–87

Year	Industry R&D performance: 1989 National Patterns	Industry R&D performance: Revision	Industry R&D performance: 1990 National Patterns	Non-Federal funds: 1989 National Patterns	Non-Federal funds: Revision	Non-Federal funds: 1990 National Patterns	Federal funds: 1989 National Patterns	Federal funds: Revision	Federal funds: 1990 National Patterns
	Millions of dollars								
1982	57,995	655	58,650	39,512	593	40,105	18,483	62	18,545
1983	63,403	1,865	65,268	42,861	1,727	44,588	20,542	138	20,680
1984	71,470	3,330	74,800	48,308	3,096	51,404	23,162	234	23,396
1985	78,269	5,970	84,239	51,439	5,604	57,043	26,830	366	27,196
1986	80,631	7,548	88,179	52,848	7,084	59,932	27,783	464	28,247
1987	85,500	8,617	94,117	55,500	7,306	62,806	30,000	1,311	31,311

NOTE: These methodological revisions were first reported in *National Patterns of R&D Resources: 1990*

Table A–2.

Revisions in industry R&D performance and impact on other variables: 1988–91

Year	Industry R&D performance: Previous estimates	Industry R&D performance: 1994 National Patterns	Non-Federal Funds: Previous estimates	Non-Federal Funds: 1994 National Patterns	Federal Funds: Previous estimates	Federal Funds: 1994 National patterns
	Millions of dollars					
1987	92,155	92,155	61,403	61,403	30,752	30,752
1988	97,889	97,015	65,772	66,672	32,117	30,343
1989	101,854	102,055	70,562	73,501	31,292	28,554
1990	104,606	109,727	73,980	81,602	30,626	28,125
1991	102,246	116,952	76,938	90,580	25,308	26,372

Year	National R&D performance: Previous estimates	National R&D performance: 1994 National Patterns	R&D/GDP: Previous estimates	R&D/GDP: 1994 National Patterns	Federal Funds as a percent of total: Previous estimates	Federal Funds as a percent of total: 1994 National Patterns	Defense R&D as percent of total: Previous estimates	Defense R&D as percent of total: 1994 National Patterns
	Millions of dollars		Percent					
1987	125,376	125,376	2.76	2.76	46.2	46.2	31.3	31.3
1988	133,764	132,890	2.73	2.71	45.8	44.8	30.2	29.5
1989	140,824	141,025	2.68	2.68	44.5	42.5	28.4	27.1
1990	146,424	151,545	2.64	2.73	43.7	40.6	27.0	25.1
1991	145,383	160,096	2.54	2.80	40.7	37.6	24.3	22.3

NOTE: These methodological revisions are being reported in this edition of *National Patterns* for the first time

Table A-3.
Distribution of industry R&D performance, by character of work

Non-Federal Funds

Census imputation

Year	Total R&D	Basic research	Applied research	Development	Undistributed residual
	Millions of dollars				
1985	57,043	2,140	11,640	37,659	5,604
1986	59,932	2,162	9,914	29,081	18,775
1987	61,403	2,332	10,558	30,819	17,694
1988	66,672	2,227	11,426	33,086	19,933
1989	73,501	2,875	12,460	36,588	21,578
1990	81,602	2,607	13,557	38,560	26,878
1991	90,580	5,817	18,243	51,480	15,040
1992	96,654	5,859	18,597	55,821	16,377

Reported in 1994 National Patterns

Year	Total R&D	Basic research	Applied research	Development	Undistributed residual
1985	57,043	2,373	12,908	41,762	0
1986	59,932	3,496	15,082	41,354	0
1987	61,403	3,583	15,153	42,667	0
1988	66,672	3,507	16,531	46,634	0
1989	73,501	3,832	17,993	51,676	0
1990	81,602	3,760	18,432	59,410	0
1991	90,580	6,470	20,984	63,126	0
1992	96,654	7,002	22,224	67,428	0

Federal Funds

Census imputation

Year	Total R&D	Basic research	Applied research	Development	Undistributed residual
	Millions of dollars				
1985	27,196	482	5,275	21,073	366
1986	27,891	370	3,444	17,074	7,003
1987	30,752	534	3,510	18,770	7,938
1988	30,343	668	3,354	20,217	6,104
1989	28,554	913	3,729	18,342	5,570
1990	28,125	967	4,101	17,914	5,143
1991	26,372	2,767	4,595	13,961	5,049
1992	24,660	2,584	4,194	13,683	4,199

Reported in 1994 National Patterns

Year	Total R&D	Basic research	Applied research	Development	Undistributed residual
1985	27,196	489	5,347	21,360	0
1986	27,891	551	4,678	22,662	0
1987	30,752	740	4,660	25,352	0
1988	30,343	993	4,217	25,133	0
1989	28,554	1,384	4,698	22,472	0
1990	28,125	1,368	6,353	20,404	0
1991	26,372	2,953	5,188	18,231	0
1992	24,660	2,792	4,951	16,917	0

NOTE: These methodological revisions for the years 1985–88 were first reported in *National Patterns of R&D Resources: 1990*

Table A-4.

Revisions in university & college and university-administered FFRDC performance of applied research and development, by Federal source of funds: 1974–90

	Universities and colleges				University-administered FFRDCs			
	1990 National Patterns		1992 National Patterns		1990 National Patterns		1992 National Patterns	
Year	Applied research	Development	Applied research	Development	Applied research	Development	Applied research	Development
	Millions of dollars							
1974	438	71	438	71	178	297	178	297
1975	516	78	516	78	213	335	203	345
1976	584	87	584	87	264	371	235	400
1977	607	112	607	112	371	413	290	494
1978	673	122	644	194	431	419	319	531
1979	873	150	709	314	468	452	342	578
1980	1,043	200	880	361	503	619	424	698
1981	1,087	225	943	364	529	696	424	801
1982	1,142	225	957	406	606	556	430	732
1983	1,217	225	1,052	387	726	539	456	809
1984	1,401	200	1,187	410	804	671	541	934
1985	1,515	200	1,261	458	835	939	591	1,183
1986	1,611	225	1,329	512	774	1,262	565	1,471
1987	1,706	250	1,452	512	693	1,501	538	1,656
1988	2,229	275	1,857	694	697	1,612	534	1,775
1989	2,300	300	2,118	724	720	1,680	605	1,795
1990	2,325	325	2,219	857	740	1,760	630	1,799

KEY: FFRDC = Federally Funded Research and Development Center

NOTE: These methodological revisions were first reported in *National Patterns of R&D Resources: 1992.*

Table A–5.

Sources of data in compiling estimates on the level of R&D expenditures in the Unted States: 1973 and 1990–94

		Federal Govt.	Industry			Universities & colleges					U&C FFRDCs	Other nonprofit institutions			
				Sources			Sources						Sources		
Year	United States	total used	Total used	Federal Govt.	Industry	Total used	Federal Govt.	Industry	U&C	Non-profits	total used	Total used	Federal Govt.	Industry	Non-profits
	National expenditures for R&D, by performing sectors and sources of funds														
1973	A	P	P	P	P	P	P	P	P	P	P	P	P	P	P
1990	A	P	P	P	P	P	P	P	P	P	P	A	S	Same as %	Same as %
1991	A	P	P	P	P	P	P	P	P	P	P	A	S	change of	change of
1992	A	P	P	P	P	P	P	P	P	P	P	A	S	industry	nonprofits
1993 (est.)...	A	P	A	S-model	P	P	P	Times series modeling			P	A	S	funds to	funds to
1994 (est.)...	A	P	A	S-model	P	A	S-model	EACH non-Federal sector			TS-model	A	S	ind. & U&C	U&C
	National expenditures for basic research, by performing sectors and sources of funds														
1973	A	P	P	P	P	P	P	—Telephone follow-up—			P	P	P	———Estimated———	
1990	A	P	P	P	P	P	P	Non-Federal basic as % of			P	A	S	Assumed:	Assumed:
1991	A	P	P	P	P	P	P	non-Federal total R&D			P	A	S	46	40
1992	A	P	P	P	P	P	P	Same for EACH sector			P	A	S	percent	percent
1993 (est.)...	A	P	A	Percent share of		P	P	Time series model total			P	A	S	of	of
1994 (est.)...	A	P	A	1992 R&D totals		A	S-model	non-Fed. basic research			TS-model	A	S	R&D	R&D
	National expenditures for applied research, by performing sectors and sources of funds														
1973	A	P	P	P	P	P	P	—Telephone follow-up—			P	P	P	———Estimated———	
1990	A	P	P	P	P	A	P-S	For EACH non-Federal			P-S	A	S	Assumed:	Assumed:
1991	A	P	P	P	P	A	P-S	sector, applied research			P-S	A	S	34	36
1992	A	P	P	P	P	A	P-S	is the nonbasic/nondevelopment residual from			P-S	A	S	percent	percent
1993 (est.)...	A	P	A	Percent share of		A	S-model				S-model	A	S	of	of
1994 (est.)...	A	P	A	1992 R&D totals		A	S-model	total R&D support			S-model	A	S	R&D	R&D
	National expenditures for development, by performing sectors and sources of funds														
1973	A	P	P	P	P	P	P	—Telephone follow-up—			P	P	P	———Estimated———	
1990	A	P	P	P	P	A	P-S	For EACH non-Federal			P-S	A	S	Assumed:	Assumed:
1991	A	P	P	P	P	A	P-S	sector, development			P-S	A	S	20	24
1992	A	P	P	P	P	A	P-S	equals 7% of reported			P-S	A	S	percent	percent
1993 (est.)...	A	P	A	Percent share of		A	S-model	or modeled			S-model	A	S	of	of
1994 (est.)...	A	P	A	1992 R&D totals		A	S-model	total R&D support			S-model	A	S	R&D	R&D

NOTE: Data are estimated for 1993 and 1994.

KEY: A = There is no single survey for this item. It is obtained by adding the appropriate expenditure details.
P = Based on surveys of R&D performers.
S = Based on surveys of Federal agencies which are the source of R&D funds.
P-S = Based on data from surveys of both performers and Federal agency sources.
S-model = Based on analytical or statistical models using Federal source-reported data.
TS-model = Based on times series modeling, such as Box-Jenkins techniques.
FFRDC = federally funded research and development center
U&C = universities and colleges

SOURCE: Compiled by NSF/SRS staff.

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Table A–6.

Revisions in number of R&D scientists and engineers: 1985 and 1989

Item	1985 Previous estimate	1985 Revised estimate	1989 Previous estimate	1989 Revised estimate
	Thousands			
Total United States R&D scientists and engineers	841.6	801.9	949.3	924.2
Industry:				
Number of full-time equivalent R&D S&Es	646.8	646.8	726.0	733.1
Federal Government:				
Number of S&Es, by work-activity	55.0	52.1	60.0	58.8
Research	22.3	22.3	22.9	24.6
Development	29.7	29.7	33.2	34.2
R&D management	2.9	—	3.9	—
Educational institutions:				
Number of full-time equivalent R&D S&Es,	81.1	—	93.7	—
Number of doctoral S&Es, by primary work activity	—	64.7	—	83.5
Basic research	—	43.6	—	52.7
Applied research	—	15.7	—	26.0
Development/design	—	1.4	—	0.9
Management/administration of R&D	—	4.0	—	3.9
Number of FTE science and engineering graduate students with research assistantships	27.2	30.5	35.1	39.5
Nonprofit organizations:				
Number of full-time equivalent R&D S&Es,	31.5	—	34.5	—
Number of doctoral S&Es, by primary work activity	—	7.8	—	9.2
Basic research	—	3.4	—	3.8
Applied research	—	2.2	—	3.2
Development/design	—	0.5	—	0.5
Management/administration of R&D	—	1.7	—	1.7
R&D S&Es per 10,000 labor force	71.8	68.4	75.6	73.0

KEY: FTE = full-time equivalent
S&Es = scientists and engineers
— = detail not available

SOURCE: NSF/SRS, Survey of Industrial Research and Development; Survey of Doctorate Recipients; Survey of Graduate Students and Postdoctorates in Science and Engineering; U.S. Office of Personnel Management; and Bureau of Labor Statistics, Employment and Earnings (annual).

APPENDIX B
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Table B-1.
Gross domestic product and GDP implicit price deflators: 1953–97

Year	Gross domestic product		GDP price deflator		Rates of inflation	
	Calendar year	Fiscal year	Calendar year	Fiscal year	Calendar year	Fiscal year
	Dollars in billions		1987=1.00		Percent	
1953	370.0	363.4	0.220	0.219	—	—
1954	370.9	367.4	0.222	0.221	0.9	0.9
1955	404.3	383.9	0.229	0.226	3.2	2.3
1956	426.2	415.2	0.236	0.234	3.1	3.5
1957	448.6	437.2	0.244	0.243	3.4	3.8
1958	454.7	447.1	0.249	0.249	2.0	2.5
1959	494.2	478.7	0.256	0.255	2.8	2.4
1960	513.4	505.9	0.260	0.261	1.6	2.4
1961	531.8	516.9	0.263	0.263	1.2	0.8
1962	571.6	554.3	0.269	0.268	2.3	1.9
1963	603.1	585.0	0.272	0.272	1.1	1.5
1964	648.0	626.5	0.277	0.276	1.3	1.5
1965	702.7	671.4	0.284	0.283	2.5	2.5
1966	769.8	738.6	0.294	0.291	3.5	2.8
1967	814.3	791.3	0.303	0.301	3.1	3.4
1968	889.3	849.8	0.318	0.312	5.0	3.7
1969	959.5	925.6	0.334	0.328	5.0	5.1
1970	1,010.7	985.6	0.352	0.346	5.4	5.5
1971	1,097.2	1,051.6	0.371	0.363	5.4	4.9
1972	1,207.0	1,145.8	0.388	0.382	4.6	5.2
1973	1,349.6	1,278.0	0.413	0.402	6.4	5.2
1974	1,458.6	1,403.3	0.449	0.433	8.7	7.7
1975	1,585.9	1,511.0	0.492	0.476	9.6	9.9
1976	1,768.4	1,685.1	0.523	0.512	6.3	7.6
1977	1,974.1	1,919.7	0.559	0.554	6.9	8.2
1978	2,232.7	2,156.4	0.603	0.596	7.9	7.6
1979	2,488.6	2,431.9	0.656	0.647	8.8	8.6
1980	2,708.0	2,644.5	0.717	0.706	9.3	9.1
1981	3,030.6	2,964.7	0.789	0.778	10.0	10.2
1982	3,149.6	3,124.9	0.838	0.836	6.2	7.5
1983	3,405.0	3,317.0	0.872	0.870	4.1	4.1
1984	3,777.2	3,696.7	0.910	0.909	4.4	4.5
1985	4,038.7	3,970.9	0.944	0.943	3.7	3.7
1986	4,268.6	4,219.6	0.969	0.971	2.6	3.0
1987	4,539.9	4,453.3	1.000	1.000	3.2	3.0
1988	4,900.4	4,810.0	1.039	1.036	3.9	3.6
1989	5,250.8	5,170.1	1.085	1.082	4.4	4.4
1990	5,546.1	5,481.5	1.133	1.120	4.4	3.5
1991	5,724.8	5,676.4	1.176	1.167	3.8	4.2
1992	6,020.2	5,921.5	1.209	1.201	2.8	2.9
1993	6,343.3	6,266.1	1.235	1.230	2.2	2.4
1994	6,736.1	6,633.6	1.261	1.254	2.1	2.0
1995 (estimated)	7,116.5	7,024.1	1.297	1.288	2.9	2.7
1996 (estimated)	7,506.6	7,407.0	1.335	1.326	2.9	3.0
1997 (estimated)	7,921.3	7,814.9	1.375	1.365	3.0	2.9

KEY: — = Data cannot be derived from the statistics shown here.

NOTES: Data are current as of March 2, 1995. Data are estimated for 1995–97.

Actual calendar year data provided by the U.S. Department of Commerce, Bureau of Economic Analysis. Fiscal year data and all projections provided by the Office of Management and Budget.

SOURCES: National Science Foundation/Division of Science Resources Studies

Table B–2.
National expenditures for R&D, by performing sectors and sources of funds: 1953–94
(page 1 of 2)

			Industry			Universities & colleges						Other nonprofit institutions[2]			
				Sources			Sources						Sources		
Year	United States	Federal Govt.[1]	Total used	Federal Govt.	Industry[3]	Total used	Federal Govt.	Industry	U&C[4]	Non-profits	U&C FFRDCs[5]	Total used	Federal Govt.	Industry	Non-profits
	Millions of dollars														
1953	5,124	1,010	3,630	1,430	2,200	255	138	19	72	26	121	108	54	26	28
1954	5,644	1,020	4,070	1,750	2,320	290	160	22	80	28	141	123	61	31	31
1955	6,172	905	4,640	2,180	2,460	312	169	25	88	30	180	135	68	35	32
1956	8,364	1,041	6,605	3,328	3,277	372	213	29	96	34	194	152	77	37	38
1957	9,775	1,220	7,731	4,335	3,396	410	229	34	109	38	240	174	86	37	51
1958	10,711	1,374	8,389	4,759	3,630	456	254	39	121	42	293	199	99	38	62
1959	12,357	1,639	9,618	5,635	3,983	526	306	39	134	47	338	236	127	42	67
1960	13,520	1,723	10,509	6,081	4,428	646	405	40	149	52	360	282	166	48	68
1961	14,320	1,878	10,908	6,240	4,668	763	500	40	165	58	410	361	226	49	86
1962	15,392	2,096	11,464	6,435	5,029	904	613	40	185	66	470	458	295	54	109
1963	17,059	2,279	12,630	7,270	5,360	1,081	760	41	207	73	530	539	365	55	119
1964	18,854	2,838	13,512	7,720	5,792	1,275	917	40	235	83	629	600	433	55	112
1965	20,044	3,093	14,185	7,740	6,445	1,474	1,073	41	267	93	629	663	477	62	124
1966	21,846	3,220	15,548	8,332	7,216	1,715	1,261	42	304	108	630	733	525	70	138
1967	23,146	3,396	16,385	8,365	8,020	1,921	1,409	48	345	119	673	771	552	74	145
1968	24,605	3,494	17,429	8,560	8,869	2,149	1,572	55	390	132	719	814	582	81	151
1969	25,629	3,501	18,308	8,451	9,857	2,225	1,600	60	420	145	725	870	616	93	161
1970	26,134	4,079	18,067	7,779	10,288	2,335	1,647	61	462	165	737	916	649	95	172
1971	26,676	4,228	18,320	7,666	10,654	2,500	1,724	70	529	177	716	912	630	98	184
1972	28,476	4,589	19,552	8,017	11,535	2,630	1,795	74	574	187	753	952	653	101	198
1973	30,718	4,762	21,249	8,145	13,104	2,884	1,985	84	613	202	817	1,006	690	105	211
1974	32,863	4,911	22,887	8,220	14,667	3,022	2,032	95	676	219	865	1,178	822	115	241
1975	35,213	5,354	24,187	8,605	15,582	3,409	2,288	113	749	259	987	1,276	875	125	276
1976	39,018	5,769	26,997	9,561	17,436	3,729	2,512	123	809	285	1,147	1,376	925	135	316
1977	42,783	6,012	29,825	10,485	19,340	4,067	2,726	139	888	314	1,384	1,495	987	150	358
1978	48,128	6,810	33,304	11,189	22,115	4,625	3,059	170	1,037	359	1,717	1,672	1,100	165	407
1979	54,939	7,418	38,226	12,518	25,708	5,366	3,598	193	1,207	368	1,935	1,994	1,350	180	464
1980	62,596	7,632	44,505	14,029	30,476	6,063	4,098	236	1,326	403	2,246	2,150	1,450	200	500
1981	71,869	8,426	51,810	16,382	35,428	6,847	4,571	292	1,549	435	2,486	2,300	1,550	225	525
1982	80,018	9,141	58,650	18,545	40,105	7,323	4,768	337	1,727	491	2,479	2,425	1,650	250	525
1983	89,143	10,582	65,268	20,680	44,588	7,881	4,989	389	1,927	576	2,737	2,675	1,850	275	550
1984	101,167	11,572	74,800	23,396	51,404	8,620	5,430	475	2,101	614	3,150	3,025	2,100	325	600

(continued)

Table B–2.
National expenditures for R&D, by performing sectors and sources of funds: 1953–94
(page 2 of 2)

			Industry			Universities & colleges						Other nonprofit institutions[2]			
				Sources			Sources						Sources		
Year	United States	Federal Govt.[1]	Total used	Federal Govt.	Industry[3]	Total used	Federal Govt.	Industry	U&C[4]	Non-profits	U&C FFRDCs[5]	Total Used	Federal Govt.	Industry	Non-profits
	Millions of dollars														
1985	113,818	12,945	84,239	27,196	57,043	9,686	6,063	560	2,369	694	3,523	3,425	2,400	375	650
1966	119,555	13,535	87,823	27,891	59,932	10,927	6,710	700	2,784	733	3,895	3,375	2,250	425	700
1987	125,376	13,413	92,155	30,752	61,403	12,152	7,342	790	3,192	828	4,206	3,450	2,200	450	800
1988	132,889	14,281	97,015	30,343	66,672	13,462	8,191	872	3,463	936	4,531	3,600	2,200	500	900
1989	140,981	15,121	102,055	28,554	73,501	14,975	8,988	995	3,921	1,071	4,730	4,100	2,500	550	1,050
1990	151,544	16,002	109,727	28,125	81,602	16,283	9,634	1,128	4,329	1,192	4,832	4,700	2,900	650	1,150
1991	160,096	15,238	116,952	26,372	90,580	17,577	10,230	1,205	4,835	1,307	5,079	5,250	3,300	700	1,250
1992	166,697	15,690	121,314	24,660	96,654	18,794	11,090	1,291	5,018	1,395	5,249	5,650	3,550	750	1,350
1993	169,515	16,556	122,000	24,000	98,000	19,911	11,957	1,374	5,111	1,469	5,298	5,750	3,600	750	1,400
1994	172,550	17,200	123,800	24,000	99,800	20,500	12,200	1,450	5,300	1,550	5,100	5,950	3,700	800	1,450

[1] Total funds used by Federal Government are from Federal sources.

[2] Expenditures for FFRDCs administered by industry and nonprofit institutions are included in the totals of the respective sectors.

[3] Industry R&D expenditures include all non-Federal sources of funds.

[4] Includes R&D funds from state and local government sources.

[5] Includes R&D expenditures of FFRDCs administered by individual universities and colleges and by university consortia. In 1993, 99 percent of total funds used were from Federal sources.

KEY: FFRDCs = Federally Funded Research and Development Centers
U&C = universities and colleges

NOTES: Data are based on annual reports by performers except for the nonprofit sector; R&D expenditures by nonprofit sector performers have been estimated since 1973 on the basis of a survey conducted in that year. Data are preliminary for 1993 and estimated for 1994. As a result of a new sample design for the underlying Survey of Industrial Research and Development, statistics for 1988–92 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See appendix A for more information. Data available to SRS as of March 3, 1995 have been incorporated.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry: 1992*; NSF/SRS, *Academic Science/Engineering: R&D Expenditures, Fiscal Year 1993*; NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1993, 1994 and 1995*; and an independent survey conducted by the Industrial Research Institute.

Table B–3.

Sources of funds for R&D, by sector: 1953–94

Year	United States	Federal Govt.	Industry	Universities & colleges	Non-profits	United States	Federal Govt.	Industry	Universities & colleges	Non-profits
	Millions of current dollars					Millions of constant 1987 dollars[1]				
1953	5,124	2,753	2,245	72	54	23,320	12,540	10,205	329	246
1954	5,644	3,132	2,373	80	59	25,453	14,135	10,690	362	266
1955	6,172	3,502	2,520	88	62	27,033	15,365	11,006	389	272
1956	8,364	4,853	3,343	96	72	35,499	20,616	14,166	410	306
1957	9,775	6,110	3,467	109	89	40,093	25,069	14,210	449	365
1958	10,711	6,779	3,707	121	104	43,016	27,225	14,888	486	418
1959	12,357	8,045	4,064	134	114	48,308	31,461	15,876	525	446
1960	13,520	8,735	4,516	149	120	51,960	33,559	17,369	571	461
1961	14,320	9,254	4,757	165	144	54,449	35,186	18,087	627	548
1962	15,392	9,909	5,123	185	175	57,267	36,881	19,045	690	651
1963	17,059	11,204	5,456	207	192	62,717	41,191	20,059	761	706
1964	18,854	12,537	5,887	235	195	68,127	45,317	21,253	851	705
1965	20,044	13,012	6,548	267	217	70,642	45,877	23,057	943	765
1966	21,846	13,968	7,328	304	246	74,501	47,689	24,927	1,045	841
1967	23,146	14,395	8,142	345	264	76,521	47,628	26,872	1,146	874
1968	24,605	14,927	9,005	390	283	77,759	47,290	28,321	1,250	898
1969	25,629	14,893	10,010	420	306	77,087	44,909	29,973	1,280	924
1970	26,134	14,891	10,444	462	337	74,597	42,622	29,67[illegible]	1,335	966
1971	26,676	14,964	10,822	529	361	72,345	40,730	29,174	1,457	984
1972	28,476	15,807	11,710	574	385	73,714	41,029	30,183	1,503	1000
1973	30,718	16,399	13,293	613	413	74,938	40,208	32,192	1,525	1,013
1974	32,863	16,850	14,877	676	460	73,916	38,170	33,141	1,561	1,043
1975	35,213	18,109	15,820	749	535	72,237	37,396	32,162	1,574	1,105
1976	39,018	19,914	17,694	809	601	75,041	38,464	33,837	1,580	1,161
1977	42,783	21,594	19,629	888	672	76,720	38,793	35,117	1,603	1,207
1978	48,128	23,875	22,450	1,037	766	80,070	39,819	37,234	1,740	1,277
1979	54,939	26,819	26,081	1,207	832	84,061	41,157	39,762	1,866	1,276
1980	62,596	29,455	30,912	1,326	903	87,649	41,385	43,118	1,878	1,268
1981	71,869	33,415	35,945	1,549	960	91,407	42,629	45,563	1,991	1,225
1982	80,018	36,583	40,692	1,727	1,016	95,541	43,702	48,559	2,066	1,214
1983	89,143	40,838	45,252	1,927	1,126	102,284	46,881	51,896	2,215	1,293
1984	101,167	45,648	52,204	2,101	1,214	111,201	50,187	57,368	2,311	1,335
1985	113,818	52,127	57,978	2,369	1,344	120,599	55,245	61,418	2,512	1,425
1986	119,555	54,281	61,057	2,784	1,433	123,320	55,966	63,009	2,867	1,477
1987	125,376	57,913	62,643	3,192	1,628	125,376	57,913	62,643	3,192	1,628
1988	132,889	59,546	68,044	3,463	1,836	127,991	57,386	65,492	3,343	1,770
1989	140,981	59,893	75,046	3,921	2,121	130,025	55,275	69,169	3,624	1,958
1990	151,544	61,493	83,380	4,329	2,342	134,135	54,587	73,604	3,865	2,079
1991	160,096	60,219	92,485	4,835	2,557	136,385	51,407	78,652	4,143	2,183
1992	166,697	60,239	98,695	5,018	2,745	138,099	50,002	81,641	4,178	2,278
1993	169,515	61,411	100,124	5,111	2,869	137,397	49,837	81,077	4,155	2,328
1994	172,550	62,200	102,050	5,300	3,000	137,025	49,479	80,934	4,226	2,386

[1] See table B-1 for GDP implicit price deflators used to convert current dollars to constant 1987 dollars.

NOTE: Data are preliminary for 1993 and estimated for 1994.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry: 1992*; NSF/SRS, *Academic Science/Engineering: R&D Expenditures, Fiscal Year 1993*; NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1993, 1994 and 1995*; and an independent survey conducted by the Industrial Research Institute.

Table B–4.
R&D performance, by sector: 1953–94

Year	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits
	Millions of current dollars						Millions of constant 1987 dollars[1]					
1953	5,124	1,010	3,630	255	121	108	23,320	4,612	16,500	1,164	553	491
1954	5,644	1,020	4,070	290	141	123	25,453	4,615	18,333	1,312	638	554
1955	6,172	905	4,640	312	180	135	27,033	4,004	20,262	1,381	796	590
1956	8,364	1,041	6,605	372	194	152	35,499	4,449	27,987	1,590	829	644
1957	9,775	1,220	7,731	410	240	174	40,093	5,021	31,684	1,687	988	713
1958	10,711	1,374	8,389	456	293	199	43,016	5,518	33,691	1,831	1,177	799
1959	12,357	1,639	9,618	526	338	236	48,308	6,427	37,570	2,063	1,325	922
1960	13,520	1,723	10,509	646	360	282	51,960	6,602	40,419	2,475	1,379	1,085
1961	14,320	1,878	10,908	763	410	361	54,449	7,141	41,475	2,901	1,559	1,373
1962	15,392	2,096	11,464	904	470	458	57,267	7,821	42,617	3,373	1,754	1,703
1963	17,059	2,279	12,630	1,081	530	539	62,717	8,379	46,434	3,974	1,949	1,982
1964	18,854	2,838	13,512	1,275	629	600	68,127	10,283	48,780	4,620	2,279	2,166
1965	20,044	3,093	14,185	1,474	629	663	70,642	10,929	49,947	5,208	2,223	2,335
1966	21,846	3,220	15,548	1,715	630	733	74,501	11,065	52,884	5,893	2,165	2,493
1967	23,146	3,396	16,385	1,921	673	771	76,521	11,282	54,076	6,382	2,236	2,545
1968	24,605	3,494	17,429	2,149	719	814	77,759	11,199	54,808	6,888	2,304	2,560
1969	25,629	3,501	18,308	2,225	725	870	77,087	10,674	54,814	6,784	2,210	2,605
1970	26,134	4,079	18,067	2,335	737	916	74,597	11,789	51,327	6,749	2,130	2,602
1971	26,676	4,228	18,320	2,500	716	912	72,345	11,647	49,380	6,887	1,972	2,458
1972	28,476	4,589	19,552	2,630	753	952	73,714	12,013	50,392	6,885	1,971	2,454
1973	30,718	4,762	21,249	2,884	817	1,006	74,938	11,846	51,450	7,174	2,032	2,436
1974	32,863	4,911	22,887	3,022	865	1,178	73,916	11,342	50,973	6,979	1,998	2,624
1975	35,213	5,354	24,187	3,409	987	1,276	72,237	11,248	49,161	7,162	2,074	2,594
1976	39,018	5,769	26,997	3,729	1,147	1,376	75,041	11,268	51,620	7,283	2,240	2,631
1977	42,783	6,012	29,825	4,067	1,384	1,495	76,720	10,852	53,354	7,341	2,498	2,674
1978	48,128	6,810	33,304	4,625	1,717	1,672	80,070	11,426	55,231	7,760	2,881	2,773
1979	54,939	7,418	38,226	5,366	1,935	1,994	84,061	11,465	58,271	8,294	2,991	3,040
1980	62,596	7,632	44,505	6,063	2,246	2,150	87,649	10,810	62,071	8,588	3,181	2,999
1981	71,869	8,426	51,810	6,847	2,486	2,300	91,407	10,830	65,665	8,801	3,195	2,915
1982	80,018	9,141	58,650	7,323	2,479	2,425	95,541	10,934	69,988	8,760	2,965	2,894
1983	89,143	10,582	65,268	7,881	2,737	2,675	102,284	12,163	74,849	9,059	3,146	3,068
1984	101,167	11,572	74,800	8,620	3,150	3,025	111,201	12,730	82,198	9,483	3,465	3,324
1985	113,818	12,945	84,239	9,686	3,523	3,425	120,599	13,727	89,236	10,271	3,736	3,628
1986	119,555	13,535	87,823	10,927	3,895	3,375	123,320	13,939	90,633	11,253	4,011	3,483
1987	125,376	13,413	92,155	12,152	4,206	3,450	125,376	13,413	92,155	12,152	4,206	3,450
1988	132,889	14,281	97,015	13,462	4,531	3,600	127,991	13,785	93,373	12,994	4,374	3,465
1989	140,981	15,121	102,055	14,975	4,730	4,100	130,025	13,975	94,060	13,840	4,372	3,779
1990	151,544	16,002	109,727	16,283	4,832	4,700	134,135	14,288	96,846	14,538	4,314	4,148
1991	160,096	15,238	116,952	17,577	5,079	5,250	136,385	13,057	99,449	15,062	4,352	4,464
1992	166,697	15,690	121,314	18,794	5,249	5,650	138,099	13,064	100,342	15,649	4,371	4,673
1993	169,515	16,556	122,000	19,911	5,298	5,750	137,397	13,460	98,785	16,188	4,307	4,656
1994	172,550	17,200	123,800	20,500	5,100	5,950	137,025	13,716	98,176	16,348	4,067	4,718

[1] See table B-1 for GDP implicit price deflators used to convert current dollars to constant 1987 dollars.

KEY: U&C = universities and colleges
FFRDCs = federally funded research and development centers

NOTE: Data are preliminary for 1993 and estimated for 1994.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry: 1992*; NSF/SRS, *Academic Science/Engineering: R&D Expenditures, Fiscal Year 1993*; NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1993, 1994 and 1995*; and an independent survey conducted by the Industrial Research Institute.

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Table B–5.

National expenditures for basic research, by performing sectors and sources of funds: 1953–94

(page 1 of 2)

			Industry			Universities & colleges						Other nonprofit institutions[2]			
				Sources			Sources						Sources		
Year	United States	Federal Govt.[1]	Total used	Federal Govt.	Industry[3]	Total used[4]	Federal Govt.	Industry	U&C[5]	Non-profits	U&C FFRDCs[6]	Total used	Federal Govt.	Industry	Non-profits[5]
	Millions of dollars														
1953	441	101	151	19	132	110	73	12	10	15	33	46	25	9	12
1954	496	102	166	23	143	136	90	14	15	17	39	53	29	11	13
1955	547	90	189	27	162	159	103	16	21	19	49	60	33	13	14
1956	680	105	253	37	216	200	130	18	30	22	51	71	39	15	17
1957	780	122	271	41	230	240	155	21	39	25	65	82	44	15	23
1958	877	126	295	43	252	281	178	24	50	29	78	97	53	16	28
1959	1,039	172	320	72	248	343	226	24	60	33	92	112	64	18	30
1960	1,194	157	376	79	297	433	299	24	72	38	97	131	80	21	30
1961	1,405	210	395	81	314	536	382	25	85	44	115	149	90	22	37
1962	1,722	249	488	143	345	659	481	25	102	51	136	190	120	24	46
1963	1,965	255	522	147	375	814	610	25	121	58	159	215	140	25	50
1964	2,289	314	549	165	384	1,003	768	24	144	67	191	232	160	25	47
1965	2,555	364	592	186	406	1,138	879	26	164	69	208	253	172	29	52
1966	2,814	385	624	173	451	1,303	1,008	27	197	71	227	275	185	32	58
1967	3,056	435	629	202	427	1,457	1,124	31	223	79	250	285	190	34	61
1968	3,297	432	642	180	462	1,650	1,251	36	276	87	276	297	197	37	63
1969	3,441	532	618	160	458	1,711	1,279	39	298	95	275	305	195	43	67
1970	3,531	559	602	158	444	1,796	1,296	40	350	110	269	305	189	44	72
1971	3,652	566	590	134	456	1,914	1,349	46	400	119	260	322	200	45	77
1972	3,801	597	593	130	463	2,022	1,420	53	415	134	244	345	214	47	84
1973	3,945	608	631	132	499	2,053	1,454	57	408	134	296	357	218	49	90
1974	4,343	696	699	163	536	2,153	1,523	60	431	139	390	405	245	54	106
1975	4,738	734	730	157	573	2,410	1,695	72	477	166	439	425	245	60	120
1976	5,130	786	819	185	634	2,549	1,841	71	475	162	512	464	265	64	135
1977	5,735	914	911	210	701	2,800	2,007	79	527	187	600	510	290	70	150
1978	6,649	1,029	1,035	250	785	3,133	2,221	99	605	208	867	585	335	80	170
1979	7,568	1,089	1,158	265	893	3,619	2,577	114	711	217	1,022	680	400	85	195
1980	8,435	1,182	1,325	290	1,035	4,036	2,861	141	793	241	1,132	760	450	95	215
1981	9,604	1,302	1,614	301	1,313	4,593	3,260	171	907	255	1,270	825	495	105	225
1982	10,439	1,465	1,904	381	1,523	4,878	3,401	195	998	284	1,327	865	535	115	215
1983	11,645	1,690	2,223	463	1,760	5,303	3,546	236	1,171	350	1,484	945	600	125	220
1984	12,931	1,861	2,608	476	2,132	5,732	3,829	283	1,254	366	1,690	1,040	650	150	240

(continued)

Table B–5.
National expenditures for basic research, by performing sectors and sources of funds: 1953–94
(page 2 of 2)

			Industry			Universities & colleges						Other nonprofit institutions[2]			
				Sources			Sources						Sources		
Year	United States	Federal Govt.[1]	Total used	Federal Govt.	Industry[3]	Total used[4]	Federal Govt.	Industry	U&C[5]	Non-profits	U&C FFRDCs[6]	Total used	Federal Govt.	Industry	Non-profits[5]
	Millions of dollars														
1985	14,210	1,923	2,862	489	2,373	6,555	4,342	342	1,447	424	1,765	1,105	675	170	260
1986	16,613	2,019	4,047	551	3,496	7,491	4,866	436	1,733	456	1,876	1,180	700	200	280
1987	18,023	2,046	4,323	740	3,583	8,391	5,374	496	2,002	519	2,033	1,230	700	210	320
1988	19,028	2,050	4,500	993	3,507	8,893	5,677	532	2,113	571	2,245	1,340	750	230	360
1989	21,248	2,371	5,216	1,384	3,832	9,789	6,192	598	2,356	643	2,352	1,520	850	250	420
1990	22,322	2,366	5,128	1,368	3,760	10,640	6,645	678	2,601	716	2,428	1,760	1,000	300	460
1991	27,985	2,446	9,423	2,953	6,470	11,601	7,123	734	2,947	797	2,595	1,920	1,100	320	500
1992	29,579	2,397	9,794	2,792	7,002	12,504	7,713	803	3,120	868	2,844	2,040	1,150	350	540
1993	30,676	2,605	9,700	2,700	7,000	13,270	8,379	845	3,143	903	2,941	2,160	1,250	350	560
1994	31,150	2,700	9,700	2,700	7,000	13,700	8,650	850	3,250	950	2,900	2,150	1,200	370	580

[1] Total funds used by Federal Government are from Federal sources.

[2] Expenditures for FFRDCs administered by industry and nonprofit institutions are included in the totals of the respective sectors.

[3] Industry R&D expenditures include all non-Federal sources of funds.

[4] Distribution by non-Federal sources has been estimated for all years.

[5] Includes R&D funds from state and local government sources.

[6] Includes R&D expenditures of FFRDCs administered by individual universities and colleges and by university consortia.

KEY: FFRDCs = Federally Funded Research and Development Centers
U&C = universities and colleges

NOTES: Data are based on annual reports by performers except for the nonprofit sector; R&D expenditures by nonprofit sector performers have been estimated since 1973 on the basis of a survey conducted in that year. Data are preliminary for 1993 and estimated for 1994. The character-of-work estimation procedure for industry's R&D expenditures was revised for 1986 and later years. As a result of a new sample design for the underlying Survey of Industrial Research and Development, statistics for 1988–92 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See appendix A for more information. Data available to SRS as of March 3, 1995 have been incorporated.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry: 1992*; NSF/SRS, *Academic Science/Engineering: R&D Expenditures, Fiscal Year 1993*; NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1993, 1994 and 1995.*

Table B–6.
Sources of funds for basic research, by sector: 1953–94

Year	United States	Federal Govt.	Industry	Universities & colleges	Non-profits	United States	Federal Govt.	Industry	Universities & colleges	Non-profits
	Millions of current dollars					Milions of constant 1987 dollars[1]				
1953	441	251	153	10	27	2,010	1,145	696	46	123
1954	496	283	168	15	30	2,240	1,279	757	68	135
1955	547	302	191	21	33	2,406	1,333	835	93	145
1956	680	362	249	30	39	2,894	1,544	1,056	128	166
1957	780	427	266	39	48	3,204	1,756	1,091	160	197
1958	877	478	292	50	57	3,522	1,920	1,173	201	229
1959	1,039	626	290	60	63	4,068	2,453	1,133	235	247
1960	1,194	712	342	72	68	4,582	2,730	1,315	276	261
1961	1,405	878	361	85	81	5,342	3,338	1,373	323	308
1962	1,722	1,129	394	102	97	6,416	4,209	1,465	381	361
1963	1,965	1,311	425	121	108	7,224	4,820	1,563	445	397
1964	2,289	1,598	433	144	114	8,283	5,786	1,563	522	412
1965	2,555	1,809	461	164	121	9,018	6,388	1,624	580	427
1966	2,814	1,978	510	197	129	9,639	6,785	1,736	677	441
1967	3,056	2,201	492	223	140	10,133	7,304	1,624	741	464
1968	3,297	2,336	535	276	150	10,511	7,464	1,685	885	477
1969	3,441	2,441	540	298	162	10,440	7,423	1,619	909	490
1970	3,531	2,471	528	350	182	10,161	7,125	1,502	1,012	522
1971	3,652	2,509	547	400	196	10,006	6,892	1,477	1,102	535
1972	3,801	2,605	563	415	218	9,912	6,805	1,453	1,086	567
1973	3,945	2,708	605	408	224	9,748	6,713	1,469	1,015	551
1974	4,343	3,017	650	431	245	9,939	6,934	1,453	995	557
1975	4,738	3,270	705	477	286	9,875	6,842	1,438	1,002	593
1976	5,130	3,589	769	475	297	9,967	6,991	1,473	928	575
1977	5,735	4,021	850	527	337	10,329	7,250	1,522	951	606
1978	6,649	4,702	964	605	378	11,124	7,878	1,601	1,015	631
1979	7,568	5,353	1,092	711	412	11,658	8,259	1,667	1,099	633
1980	8,435	5,915	1,271	793	456	11,902	8,362	1,776	1,123	641
1981	9,604	6,628	1,589	907	480	12,301	8,505	2,017	1,166	613
1982	10,439	7,109	1,833	998	499	12,479	8,501	2,188	1,194	596
1983	11,645	7,783	2,121	1,171	570	13,377	8,943	2,433	1,346	655
1984	12,931	8,506	2,565	1,254	606	14,221	9,356	2,819	1,380	666
1985	14,210	9,194	2,885	1,447	684	15,064	9,748	3,057	1,534	725
1986	16,613	10,012	4,132	1,733	736	17,120	10,314	4,263	1,785	759
1987	18,023	10,893	4,289	2,002	839	18,023	10,893	4,289	2,002	839
1988	19,028	11,715	4,269	2,113	931	18,351	11,303	4,110	2,040	898
1989	21,248	13,149	4,680	2,356	1,063	19,620	12,147	4,315	2,177	981
1990	22,322	13,807	4,738	2,601	1,176	19,860	12,303	4,189	2,322	1,045
1991	27,985	16,217	7,524	2,947	1,297	23,906	13,870	6,403	2,525	1,108
1992	29,579	16,896	8,155	3,120	1,408	24,563	14,047	6,750	2,598	1,169
1993	30,676	17,875	8,195	3,143	1,463	24,901	14,520	6,638	2,555	1,188
1994	31,150	18,150	8,220	3,250	1,530	24,788	14,456	6,522	2,592	1,218

[1] See table B-1 for GDP implicit price deflators used to convert current dollars to constant 1987 dollars.

NOTE: Data are preliminary for 1993 and estimated for 1994.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry: 1992*; NSF/SRS, *Academic Science/Engineering: R&D Expenditures, Fiscal Year 1993*; NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1993, 1994 and 1995.*

Table B–7.
Basic research performance, by sector: 1953–94

Year	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits
	Millions of current dollars						Millions of constant 1987 dollars[1]					
1953	441	101	151	110	33	46	2,010	461	686	502	151	209
1954	496	102	166	136	39	53	2,240	462	748	615	176	239
1955	547	90	189	159	49	60	2,406	398	825	704	217	262
1956	680	105	253	200	51	71	2,894	449	1,072	855	218	301
1957	780	122	271	240	65	82	3,204	502	1,111	988	267	336
1958	877	126	295	281	78	97	3,522	506	1,185	1,129	313	390
1959	1,039	172	320	343	92	112	4,068	675	1,250	1,345	361	438
1960	1,194	157	376	433	97	131	4,582	602	1,446	1,659	372	504
1961	1,405	210	395	536	115	149	5,342	798	1,502	2,038	437	567
1962	1,722	249	488	659	136	190	6,416	929	1,814	2,459	507	706
1963	1,965	255	522	814	159	215	7,224	938	1,919	2,993	585	790
1964	2,289	314	549	1,003	191	232	8,283	1,138	1,982	3,634	692	838
1965	2,555	364	592	1,138	208	253	9,018	1,286	2,085	4,021	735	891
1966	2,814	385	624	1,303	227	275	9,639	1,323	2,122	4,478	780	935
1967	3,056	435	629	1,457	250	285	10,133	1,445	2,076	4,841	831	941
1968	3,297	432	642	1,650	276	297	10,511	1,385	2,019	5,288	885	934
1969	3,441	532	618	1,711	275	305	10,440	1,622	1,850	5,216	838	913
1970	3,531	559	602	1,796	269	305	10,161	1,616	1,710	5,191	777	866
1971	3,652	566	590	1,914	260	322	10,006	1,559	1,590	5,273	716	868
1972	3,801	597	593	2,022	244	345	9,912	1,563	1,528	5,293	639	889
1973	3,945	608	631	2,053	296	357	9,748	1,512	1,528	5,107	736	864
1974	4,343	696	699	2,153	390	405	9,939	1,607	1,557	4,972	901	902
1975	4,738	734	730	2,410	439	425	9,875	1,542	1,484	5,063	922	864
1976	5,130	786	819	2,549	512	464	9,967	1,535	1,566	4,979	1,000	887
1977	5,735	914	911	2,800	600	510	10,329	1,650	1,630	5,054	1,083	912
1978	6,649	1,029	1,035	3,133	867	585	11,124	1,727	1,716	5,257	1,455	970
1979	7,568	1,089	1,158	3,619	1,022	680	11,658	1,683	1,765	5,594	1,580	1,037
1980	8,435	1,182	1,325	4,036	1,132	760	11,902	1,674	1,848	5,717	1,603	1,060
1981	9,604	1,302	1,614	4,593	1,270	825	12,301	1,674	2,046	5,904	1,632	1,046
1982	10,439	1,465	1,904	4,878	1,327	365	12,479	1,752	2,272	5,835	1,587	1,032
1983	11,645	1,690	2,223	5,303	1,484	945	13,377	1,943	2,549	6,095	1,706	1,084
1984	12,931	1,861	2,608	5,732	1,690	1,040	14,221	2,047	2,866	6,306	1,859	1,143
1985	14,210	1,923	2,862	6,555	1,765	1,105	15,064	2,039	3,032	6,951	1,872	1,171
1986	16,613	2,019	4,047	7,491	1,876	1,180	17,120	2,079	4,176	7,715	1,932	1,218
1987	18,023	2,046	4,323	8,391	2,033	1,230	18,023	2,046	4,323	8,391	2,033	1,230
1988	19,028	2,050	4,500	8,893	2,245	1,340	18,351	1,979	4,331	8,584	2,167	1,290
1989	21,248	2,371	5,216	9,789	2,352	1,520	19,620	2,191	4,807	9,047	2,174	1,401
1990	22,322	2,366	5,128	10,640	2,428	1,760	19,860	2,113	4,526	9,500	2,168	1,553
1991	27,985	2,446	9,423	11,601	2,595	1,920	23,906	2,096	8,013	9,941	2,224	1,633
1992	29,579	2,397	9,794	12,504	2,844	2,040	24,563	1,996	8,101	10,411	2,368	1,687
1993	30,676	2,605	9,700	13,270	2,941	2,160	24,901	2,118	7,854	10,789	2,391	1,749
1994	31,150	2,700	9,700	13,700	2,900	2,150	24,788	2,153	7,692	10,925	2,313	1,705

[1] See table B-1 for GDP implicit price deflators used to convert current dollars to constant 1987 dollars.

KEY: U&C = universities and colleges
FFRDCs = Federally Funded Research and Development Centers

NOTE: Data are preliminary for 1993 and estimated for 1994.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry: 1992;* NSF/SRS, *Academic Science/Engineering: R&D Expenditures, Fiscal Year 1993;* NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1993, 1994 and 1995.*

Table B–8.
National expenditures for applied research, by performing sectors and sources of funds: 1953–94
(page 1 of 2)

			Industry			Universities & colleges						Other nonprofit institutions[2]			
				Sources			Sources						Sources		
Year	United States	Federal Govt.[1]	Total used	Federal Govt.	Industry[3]	Total used[4]	Federal Govt.	Industry	U&C[5]	Non-profits	U&C FFRDCs[6]	Total used	Federal Govt.	Industry	Non-profits[5]
	Millions of dollars														
1953	1,279	345	726	288	438	130	57	6	57	10	44	34	13	11	10
1954	1,390	349	814	322	492	137	61	7	59	10	51	39	15	13	11
1955	1,481	310	928	368	560	136	58	8	60	10	65	42	17	14	11
1956	1,889	356	1,268	474	794	147	68	9	59	11	71	47	19	14	14
1957	2,374	417	1,670	678	992	145	62	11	61	11	86	56	22	14	20
1958	2,699	474	1,911	774	1,137	148	64	12	61	11	102	64	25	14	25
1959	2,900	558	1,991	813	1,178	155	67	12	64	12	119	77	35	15	27
1960	3,020	595	2,029	833	1,196	179	88	13	66	12	122	95	50	17	28
1961	3,065	634	1,977	812	1,165	192	98	13	69	12	135	127	75	17	35
1962	3,665	702	2,449	1,011	1,438	205	109	13	70	13	155	154	90	19	45
1963	3,742	715	2,457	1,007	1,450	227	128	14	72	13	170	173	105	19	49
1964	4,128	903	2,600	1,040	1,560	232	127	14	77	14	202	191	125	19	47
1965	4,339	990	2,658	1,038	1,620	279	157	13	88	21	204	208	135	21	52
1966	4,601	997	2,843	1,039	1,804	328	194	13	89	32	207	226	145	24	57
1967	4,780	1,027	2,915	1,066	1,849	374	222	15	102	35	219	245	160	25	60
1968	5,130	1,110	3,124	1,043	2,081	403	253	16	97	37	231	262	172	28	62
1969	5,315	1,113	3,287	1,015	2,272	407	246	16	105	40	210	298	200	32	66
1970	5,738	1,345	3,427	1,049	2,378	427	267	16	99	45	216	323	220	33	70
1971	5,759	1,322	3,415	974	2,441	474	292	19	115	48	210	338	230	34	74
1972	6,011	1,387	3,514	952	2,562	524	320	18	140	46	221	365	251	35	79
1973	6,598	1,480	3,825	993	2,832	713	461	23	172	57	227	353	234	36	83
1974	7,189	1,574	4,288	1,025	3,263	736	438	29	203	66	178	413	280	40	93
1975	7,802	1,730	4,570	1,130	3,440	851	515	34	225	77	203	448	300	43	105
1976	8,954	2,093	5,112	1,200	3,912	1,016	584	43	282	107	235	498	330	48	120
1977	9,570	2,044	5,636	1,325	4,311	1,067	607	46	303	111	290	533	345	53	135
1978	10,584	2,191	6,300	1,430	4,870	1,184	644	56	354	130	319	590	385	55	150
1979	11,976	2,392	7,225	1,555	5,670	1,310	708	65	412	125	339	710	480	60	170
1980	13,610	2,484	8,450	1,900	6,550	1,530	878	78	440	134	421	725	480	65	180
1981	16,363	2,732	10,699	2,340	8,359	1,731	946	101	534	150	421	780	515	75	190
1982	18,151	2,729	12,323	2,960	9,363	1,858	959	118	608	173	426	815	540	85	190
1983	20,262	3,020	13,927	3,641	10,286	1,988	1,055	126	621	186	452	875	580	95	200
1984	22,388	2,903	15,765	4,224	11,541	2,254	1,190	159	700	205	536	930	600	110	220

(continued)

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Table B–8.

National expenditures for applied research, by performing sectors and sources of funds: 1953–94

(page 2 of 2)

Year	United States	Federal Govt.[1]	Industry			Universities & colleges					U&C FFRDCs[6]	Other nonprofit institutions[2]			
			Total used	Sources: Federal Govt.	Sources: Industry[3]	Total used[4]	Sources: Federal Govt.	Sources: Industry	Sources: U&C[5]	Sources: Non-profits		Total used	Sources: Federal Govt.	Sources: Industry	Sources: Non-profits[5]
	Millions of dollars														
1985	25,327	3,133	18,255	5,347	12,908	2,418	1,262	179	756	221	586	935	575	130	230
1986	27,080	3,141	19,760	4,678	15,082	2,628	1,331	215	856	226	561	990	600	140	250
1987	27,689	3,392	19,813	4,660	15,153	2,912	1,455	239	967	251	532	1,040	600	150	290
1988	29,221	3,288	20,748	4,217	16,531	3,516	1,830	279	1,108	299	529	1,140	650	170	320
1989	32,277	3,611	22,691	4,698	17,993	4,055	2,084	327	1,291	353	600	1,320	750	190	380
1990	34,822	3,587	24,785	6,353	18,432	4,346	2,157	371	1,425	393	624	1,480	850	220	410
1991	37,357	4,093	26,172	5,188	20,984	4,478	2,122	387	1,550	419	924	1,690	1,000	240	450
1992	38,843	4,219	27,175	4,951	22,224	4,714	2,340	398	1,547	429	935	1,800	1,050	260	490
1993	40,384	4,755	27,900	5,200	22,700	5,007	2,501	433	1,610	463	962	1,760	1,000	260	500
1994	41,040	4,900	28,300	5,200	23,100	5,160	2,500	490	1,680	490	820	1,860	1,050	290	520

[1] Total funds used by Federal Government are from Federal sources.

[2] Expenditures for FFRDCs administered by industry and nonprofit institutions are included in the totals of the respective sectors.

[3] Industry R&D expenditures include all non-Federal sources of funds.

[4] Applied research totals have been estimated since 1978. Distribution by non-Federal sources has been estimated for all years.

[5] Includes R&D funds from state and local government sources.

[6] Includes R&D expenditures of FFRDCs administered by individual universities and colleges and by university consortia. Data have been estimated since 1978.

KEY: FFRDCs = federally funded research and development centers
U&C = universities and colleges

NOTES: Data are based on annual reports by performers except for the nonprofit sector; R&D expenditures by nonprofit sector performers have been estimated since 1973 on the basis of a survey conducted in that year. Data are preliminary for 1993 and estimated for 1994. The character-of-work estimation procedure for industry's R&D expenditures was revised for 1986 and later years. As a result of a new sample design for the underlying Survey of Industrial Research and Development, statistics for 1988–92 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See appendix A for more information. Data available to SRS as of March 3, 1995 have been incorporated.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry: 1992*; NSF/SRS, *Academic Science/Engineering: R&D Expenditures, Fiscal Year 1993*; NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1993, 1994 and 1995.*

Table B–9.
Sources of funds for applied research, by sector: 1953–94

Year	United States	Federal Govt.	Industry	Universities & colleges	Non-profits	United States	Federal Govt.	Industry	Universities & colleges	Non-profits
	Millions of current dollars					Millions of constant 1987 dollars[1]				
1953	1,279	747	455	57	20	5,824	3,405	2,068	260	91
1954	1,390	798	512	59	21	6,272	3,604	2,306	267	95
1955	1,481	818	582	60	21	6,497	3,597	2,542	265	92
1956	1,889	988	817	59	25	8,025	4,204	3,462	252	106
1957	2,374	1,265	1,017	61	31	9,740	5,194	4,168	251	127
1958	2,699	1,439	1,163	61	36	10,839	5,779	4,671	245	145
1959	2,900	1,592	1,205	64	39	11,341	6,230	4,707	251	153
1960	3,020	1,688	1,226	66	40	11,602	6,480	4,715	253	154
1961	3,065	1,754	1,195	69	47	11,654	6,669	4,544	262	179
1962	3,665	2,067	1,470	70	58	13,639	7,697	5,465	261	216
1963	3,742	2,125	1,483	72	62	13,757	7,813	5,452	265	228
1964	4,128	2,397	1,593	77	61	14,920	8,670	5,751	279	220
1965	4,339	2,524	1,654	88	73	15,297	8,904	5,824	311	257
1966	4,601	2,582	1,841	89	89	15,703	8,831	6,262	306	304
1967	4,780	2,694	1,889	102	95	15,811	8,923	6,235	339	314
1968	5,130	2,809	2,125	97	99	16,238	8,930	6,683	311	314
1969	5,315	2,784	2,320	105	106	16,008	8,421	6,947	320	320
1970	5,738	3,097	2,427	99	115	16,399	8,888	6,896	286	329
1971	5,759	3,028	2,494	115	122	15,642	8,270	6,724	317	332
1972	6,011	3,131	2,615	140	125	15,579	8,148	6,740	366	324
1973	6,598	3,395	2,891	172	140	16,136	8,364	7,002	428	343
1974	7,189	3,495	3,332	203	159	16,216	7,964	7,423	469	360
1975	7,802	3,878	3,517	225	182	16,048	8,049	7,151	473	375
1976	8,954	4,442	4,003	282	227	17,258	8,613	7,656	551	438
1977	9,570	4,611	4,410	303	246	17,175	8,296	7,890	547	442
1978	10,584	4,969	4,981	354	280	17,624	8,302	8,261	594	467
1979	11,976	5,474	5,795	412	295	18,342	8,417	8,835	637	452
1980	13,610	6,163	6,693	440	314	19,078	8,678	9,336	623	441
1981	16,363	6,954	8,535	534	340	20,826	8,887	10,819	686	434
1982	18,151	7,614	9,566	608	363	21,674	9,098	11,416	727	434
1983	20,262	8,748	10,507	621	386	23,251	10,044	12,050	714	443
1984	22,388	9,453	11,810	700	425	24,609	10,394	12,978	770	467
1985	25,327	10,903	13,217	756	451	26,836	11,555	14,001	802	478
1986	27,080	10,311	15,437	856	476	27,933	10,630	15,930	882	491
1987	27,689	10,639	15,542	967	541	27,689	10,639	15,542	967	541
1988	29,221	10,514	16,980	1,108	619	28,145	10,135	16,343	1,070	597
1989	32,277	11,743	18,510	1,291	733	29,770	10,839	17,061	1,193	676
1990	34,822	13,571	19,023	1,425	803	30,822	12,043	16,794	1,272	713
1991	37,357	13,327	21,611	1,550	869	31,828	11,379	18,379	1,328	742
1992	38,843	13,495	22,882	1,547	919	32,183	11,203	18,929	1,288	763
1993	40,384	14,418	23,393	1,610	963	32,735	11,702	18,943	1,309	781
1994	41,040	14,470	23,880	1,680	1,010	32,594	11,511	18,940	1,340	803

[1] See table B-1 for GDP implicit price deflators used to convert current dollars to constant 1987 dollars.

NOTE: Data are preliminary for 1993 and estimated for 1994.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry: 1992*; NSF/SRS, *Academic Science/Engineering: R&D Expenditures, Fiscal Year 1993*; NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1993, 1994 and 1995*.

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Table B–10.

Applied research performance, by sector: 1953–94

Year	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits
	Millions of current 1987 dollars						Millions of constant 1987 dollars[1]					
1953	1,279	345	726	130	44	34	5,824	1,575	3,300	594	201	155
1954	1,390	349	814	137	51	39	6,272	1,579	3,667	620	231	176
1955	1,481	310	928	136	65	42	6,497	1,372	4,052	602	288	183
1956	1,889	356	1,268	147	71	47	8,025	1,521	5,373	628	303	199
1957	2,374	417	1,670	145	86	56	9,740	1,716	6,844	597	354	230
1958	2,699	474	1,911	148	102	64	10,839	1,904	7,675	594	410	257
1959	2,900	558	1,991	155	119	77	11,341	2,188	7,777	608	467	301
1960	3,020	595	2,029	179	122	95	11,602	2,280	7,804	686	467	365
1961	3,065	634	1,977	192	135	127	11,654	2,411	7,517	730	513	483
1962	3,665	702	2,449	205	155	154	13,639	2,619	9,104	765	578	572
1963	3,742	715	2,457	227	170	173	13,757	2,629	9,033	835	625	636
1964	4,128	903	2,600	232	202	191	14,920	3,272	9,386	841	732	690
1965	4,339	990	2,658	279	204	208	15,296	3,498	9,359	986	721	732
1966	4,601	997	2,843	328	207	226	15,703	3,426	9,670	1,127	711	769
1967	4,780	1,027	2,915	374	219	245	15,811	3,412	9,620	1,243	728	809
1968	5,130	1,110	3,124	403	231	262	16,238	3,558	9,824	1,292	740	824
1969	5,315	1,113	3,287	407	210	298	16,008	3,393	9,841	1,241	640	892
1970	5,738	1,345	3,427	427	216	323	16,399	3,887	9,736	1,234	624	918
1971	5,759	1,322	3,415	474	210	338	15,642	3,642	9,205	1,306	579	911
1972	6,011	1,387	3,514	524	221	365	15,579	3,631	9,057	1,372	579	941
1973	6,598	1,480	3,825	713	227	353	16,136	3,682	9,262	1,774	565	855
1974	7,189	1,574	4,288	736	178	413	16,216	3,635	9,550	1,700	411	920
1975	7,802	1,730	4,570	851	203	448	16,048	3,634	9,289	1,788	426	911
1976	8,954	2,093	5,112	1,016	235	498	17,258	4,088	9,774	1,984	459	952
1977	9,570	2,044	5,636	1,067	290	533	17,175	3,690	10,082	1,926	523	953
1978	10,584	2,191	6,300	1,184	319	590	17,624	3,676	10,448	1,987	535	978
1979	11,976	2,392	7,225	1,310	339	710	18,342	3,697	11,014	2,025	524	1,082
1980	13,610	2,484	8,450	1,530	421	725	19,078	3,518	11,785	2,167	596	1,011
1981	16,363	2,732	10,699	1,731	421	780	20,826	3,512	13,560	2,225	541	989
1982	18,151	2,729	12,323	1,858	426	815	21,674	3,264	14,705	2,222	510	973
1983	20,262	3,020	13,927	1,988	452	875	23,251	3,471	15,971	2,285	520	1,003
1984	22,388	2,903	15,765	2,254	536	930	24,609	3,194	17,324	2,480	590	1,022
1985	25,327	3,133	18,255	2,418	586	935	26,836	3,322	19,338	2,564	621	990
1986	27,080	3,141	19,760	2,628	561	990	27,933	3,235	20,392	2,706	578	1,022
1987	27,689	3,392	19,813	2,912	532	1,040	27,689	3,392	19,813	2,912	532	1,040
1988	29,221	3,288	20,748	3,516	529	1,140	28,145	3,174	19,969	3,394	511	1,097
1989	32,277	3,611	22,691	4,055	600	1,320	29,770	3,337	20,913	3,748	555	1,217
1990	34,822	3,587	24,785	4,346	624	1,480	30,822	3,203	21,876	3,880	557	1,306
1991	37,357	4,093	26,172	4,478	924	1,690	31,828	3,507	22,255	3,837	792	1,437
1992	38,843	4,219	27,175	4,714	935	1,800	32,183	3,513	22,477	3,925	779	1,489
1993	40,384	4,755	27,900	5,007	962	1,760	32,735	3,866	22,591	4,071	782	1,425
1994	41,040	4,900	28,300	5,160	820	1,860	32,594	3,907	22,443	4,115	654	1,475

[1] See table B-1 for GDP implicit price deflators used to convert current dollars to constant 1987 dollars.

KEY: U&C = Universities and colleges
FFRDCs = Federally Funded Research and Development Centers

NOTE: Data are preliminary for 1993 and estimated for 1994.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry: 1992*; NSF/SRS, *Academic Science/Engineering: R&D Expenditures, Fiscal Year 1993*; NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1993, 1994 and 1995.*

Table B–11.
National expenditures for development, by performing sectors and sources of funds: 1953–94
(page 1 of 2)

Year	United States	Federal Govt.[1]	Industry			Universities & colleges					U&C FFRDCs[6]	Other nonprofit institutions[2]			
			Total used	Sources		Total used[4]	Sources					Total used	Sources		
				Federal Govt.	Industry[3]		Federal Govt.	Industry	U&C[5]	Non-profits			Federal Govt.	Industry	Non-profits[5]
	Millions of dollars														
1953	3,404	564	2,753	1,123	1,630	15	8	1	5	1	44	28	16	6	6
1954	3,758	569	3,090	1,405	1,685	17	9	1	6	1	51	31	17	7	7
1955	4,144	505	3,523	1,785	1,738	17	8	1	7	1	66	33	18	8	7
1956	5,795	580	5,084	2,817	2,267	25	15	2	7	1	72	34	19	8	7
1957	6,621	681	5,790	3,616	2,174	25	12	2	9	2	89	36	20	8	8
1958	7,135	774	6,183	3,942	2,241	27	12	3	10	2	113	38	21	8	9
1959	8,418	909	7,307	4,750	2,557	28	13	3	10	2	127	47	28	9	10
1960	9,306	971	8,104	5,169	2,935	34	18	3	11	2	141	56	36	10	10
1961	9,850	1,034	8,536	5,347	3,189	35	20	2	11	2	160	85	61	10	14
1962	10,005	1,145	8,527	5,281	3,246	40	23	2	13	2	179	114	85	11	18
1963	11,352	1,309	9,651	6,116	3,535	40	22	2	14	2	201	151	120	11	20
1964	12,437	1,621	10,363	6,515	3,848	40	22	2	14	2	236	177	148	11	18
1965	13,150	1,739	10,935	6,516	4,419	57	37	2	15	3	217	202	170	12	20
1966	14,431	1,838	12,081	7,120	4,961	84	59	2	18	5	196	232	195	14	23
1967	15,310	1,934	12,841	7,097	5,744	90	63	2	20	5	204	241	202	15	24
1968	16,178	1,952	13,663	7,337	6,326	96	68	3	17	8	212	255	213	16	26
1969	16,873	1,856	14,403	7,276	7,127	107	75	5	17	10	240	267	221	18	28
1970	16,865	2,175	14,038	6,572	7,466	112	84	5	13	10	252	288	240	18	30
1971	17,265	2,340	14,315	6,558	7,757	112	83	5	14	10	246	252	200	19	33
1972	18,664	2,605	15,445	6,935	8,510	84	55	3	19	7	288	242	188	19	35
1973	20,175	2,674	16,793	7,020	9,773	118	70	4	33	11	294	296	238	20	38
1974	21,331	2,641	17,900	7,032	10,868	133	71	6	42	14	297	360	297	21	42
1975	22,673	2,890	18,887	7,318	11,569	148	78	7	47	16	345	403	330	22	51
1976	24,934	2,890	21,066	8,176	12,890	164	87	9	52	16	400	414	330	23	61
1977	27,478	3,054	23,278	8,950	14,328	200	112	14	58	16	494	452	352	27	73
1978	30,895	3,590	25,969	9,309	16,460	308	194	15	78	21	531	497	380	30	87
1979	35,395	3,937	29,843	10,698	19,145	437	313	14	84	26	574	604	470	35	99
1980	40,551	3,966	34,730	11,839	22,891	497	359	17	93	28	693	665	520	40	105
1981	45,902	4,392	39,497	13,741	25,756	523	365	20	108	30	795	695	540	45	110
1982	51,428	4,947	44,423	15,204	29,219	587	408	24	121	34	726	745	575	50	120
1983	57,236	5,872	49,118	16,576	32,542	590	388	27	135	40	801	855	670	55	130
1984	65,848	6,808	56,427	18,696	37,731	634	411	33	147	43	924	1,055	850	65	140

(continued)

Table B–11.

National expenditures for development, by performing sectors and sources of funds: 1953–94
(page 2 of 2)

			Industry			Universities & colleges						Other nonprofit institutions[2]			
				Sources			Sources						Sources		
Year	United States	Federal Govt.[1]	Total used	Federal Govt.	Industry[3]	Total used[4]	Federal Govt.	Industry	U&C[5]	Non-profits	U&C FFRDCs[6]	Total used	Federal Govt.	Industry	Non-profits[5]
	Millions of dollars														
1985	74,281	7,889	63,122	21,360	41,762	713	459	39	166	49	1,172	1,385	1,150	75	160
1986	75,862	8,375	64,016	22,662	41,354	808	513	49	195	51	1,458	1,205	950	85	170
1987	79,664	7,975	68,019	25,352	42,667	849	513	55	223	58	1,641	1,180	900	90	190
1988	84,640	8,943	71,767	25,133	46,634	1,053	684	61	242	66	1,757	1,120	800	100	220
1989	87,456	9,139	74,148	22,472	51,676	1,131	712	70	274	75	1,778	1,260	900	110	250
1990	94,400	10,049	79,814	20,404	59,410	1,297	832	79	303	83	1,780	1,460	1,050	130	280
1991	94,754	8,699	81,357	18,231	63,126	1,498	985	84	338	91	1,560	1,640	1,200	140	300
1992	98,275	9,074	84,345	16,917	67,428	1,576	1,037	90	351	98	1,470	1,810	1,350	140	320
1993	98,455	9,196	84,400	16,100	68,300	1,634	1,077	96	358	103	1,395	1,830	1,350	140	340
1994	100,360	9,600	85,800	16,100	69,700	1,640	1,050	110	370	110	1,380	1,940	1,450	140	350

[1] Total funds used by Federal Government are from Federal sources.

[2] Expenditures for FFRDCs administered by industry and nonprofit institutions are included in the totals of the respective sectors.

[3] Industry R&D expenditures include all non-Federal sources of funds.

[4] Development totals have been estimated since 1978. Distribution by non-Federal sources has been estimated for all years.

[5] Includes R&D funds from state and local government sources.

[6] Includes R&D expenditures of FFRDCs administered by individual universities and colleges and by university consortia. Data have been estimated since 1978.

KEY: FFRDCs = Federally Funded Research and Development Centers
U&C = Universities and colleges

NOTES: Data are based on annual reports by performers except for the nonprofit sector; R&D expenditures by nonprofit sector performers have been estimated since 1973 on the basis of a survey conducted in that year. Data are preliminary for 1993 and estimated for 1994. The character-of-work estimation procedure for industry's R&D expenditures was revised for 1986 and later years. As a result of a new sample design for the underlying Survey of Industrial Research and Development, statistics for 1988–92 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See appendix A for more information. Data available to SRS as of March 3, 1995 have been incorporated.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry: 1992*; NSF/SRS, *Academic Science/Engineering: R&D Expenditures, Fiscal Year 1993*; NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1993, 1994 and 1995*.

Table B–12.
Sources of funds for development, by sector: 1953–94

Year	United States	Federal Govt.	Industry	Universities & colleges	Non-profits	United States	Federal Govt.	Industry	Universities & colleges	Non-profits
	Millions of current dollars					Millions of constant 1987 dollars[1]				
1953	3,404	1,755	1,637	5	7	15,486	7,990	7,441	23	32
1954	3,758	2,051	1,693	6	8	16,941	9,252	7,626	27	36
1955	4,144	2,382	1,747	7	8	18,130	10,435	7,629	31	35
1956	5,795	3,503	2,277	7	8	24,580	14,867	9,648	30	34
1957	6,621	4,418	2,184	9	10	27,149	18,120	8,951	37	41
1958	7,135	4,862	2,252	10	11	28,655	19,526	9,044	40	44
1959	8,418	5,827	2,569	10	12	32,899	22,778	10,035	39	47
1960	9,306	6,335	2,948	11	12	35,775	24,349	11,338	42	46
1961	9,850	6,622	3,201	11	16	37,452	25,179	12,171	42	61
1962	10,005	6,713	3,259	13	20	37,212	24,974	12,115	49	74
1963	11,352	7,768	3,548	14	22	41,735	28,559	13,044	51	81
1964	12,437	8,542	3,861	14	20	44,924	30,862	13,939	51	72
1965	13,150	8,679	4,433	15	23	46,328	30,585	15,609	53	81
1966	14,431	9,408	4,977	18	28	49,159	32,073	16,929	62	95
1967	15,310	9,500	5,761	20	29	50,577	31,401	19,013	66	96
1968	16,178	9,782	6,345	17	34	51,011	30,896	19,953	54	107
1969	16,873	9,668	7,150	17	38	50,639	29,065	21,407	52	114
1970	16,865	9,323	7,489	13	40	48,037	26,609	21,276	38	114
1971	17,265	9,427	7,781	14	43	46,697	25,568	20,973	39	116
1972	18,664	10,071	8,532	19	42	48,224	26,076	21,990	50	109
1973	20,175	10,296	9,797	33	49	49,054	25,131	23,722	82	119
1974	21,331	10,338	10,895	42	56	47,761	23,272	24,266	97	126
1975	22,673	10,961	11,598	47	67	46,314	22,505	23,574	99	137
1976	24,934	11,883	12,922	52	77	47,817	22,860	24,708	102	148
1977	27,478	12,962	14,369	58	89	49,216	23,247	25,705	105	159
1978	30,895	14,204	16,505	78	108	51,322	23,640	27,372	131	180
1979	35,395	15,992	19,194	84	125	54,061	24,480	29,259	130	191
1980	40,551	17,377	22,948	93	133	56,669	24,345	32,006	132	186
1981	45,902	19,833	25,821	108	140	58,280	25,236	32,727	139	178
1982	51,428	21,860	29,293	121	154	61,388	26,103	34,956	145	184
1983	57,236	24,307	32,624	135	170	65,657	27,894	37,413	155	195
1984	65,848	27,689	37,829	147	183	72,371	30,437	41,570	162	201
1985	74,281	32,030	41,876	166	209	78,698	33,941	44,360	176	221
1986	75,862	33,958	41,488	195	221	78,266	35,022	42,815	201	228
1987	79,664	36,381	42,812	223	248	79,664	36,381	42,812	223	248
1988	84,640	37,317	46,795	242	286	81,496	35,948	45,039	234	275
1989	87,456	35,001	51,856	274	325	80,635	32,289	47,794	253	300
1990	94,400	34,115	59,619	303	363	83,453	30,240	52,621	271	321
1991	94,754	30,675	63,350	338	391	80,650	26,158	53,870	290	333
1992	98,275	29,848	67,658	351	418	81,353	24,752	55,962	292	346
1993	98,455	29,118	68,536	358	443	79,761	23,616	55,495	291	359
1994	100,360	29,580	69,950	370	460	79,643	23,511	55,472	295	365

[1] See table B-1 for GDP implicit price deflators used to convert current dollars to constant 1987 dollars.

NOTE: Data are preliminary for 1993 and estimated for 1994.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry: 1992;* NSF/SRS, *Academic Science/Engineering: R&D Expenditures, Fiscal Year 1993;* NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1993, 1994 and 1995.*

Table B–13.

Development performance, by sector: 1953–94

Year	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits	United States	Federal Govt.	Industry	Universities & colleges	U&C FFRDCs	Non-profits
	Millions of current dollars						Millions of constant 1987 dollars[1]					
1953	3,404	564	2,753	15	44	28	15,486	2,575	12,514	68	201	127
1954	3,758	569	3,090	17	51	31	16,941	2,575	13,919	77	231	140
1955	4,144	505	3,523	17	66	33	18,130	2,235	15,384	75	292	144
1956	5,795	580	5,084	25	72	34	24,580	2,479	21,542	107	308	144
1957	6,621	681	5,790	25	89	36	27,149	2,802	23,730	103	366	148
1958	7,135	774	6,183	27	113	38	28,655	3,108	24,831	108	454	153
1959	8,418	909	7,307	28	127	47	32,899	3,565	28,543	110	498	184
1960	9,306	971	8,104	34	141	56	35,775	3,720	31,169	130	540	215
1961	9,850	1,034	8,536	35	160	85	37,452	3,932	32,456	133	608	323
1962	10,005	1,145	8,527	40	179	114	37,212	4,272	31,699	149	668	424
1963	11,352	1,309	9,651	40	201	151	41,735	4,813	35,482	147	739	555
1964	12,437	1,621	10,363	40	236	177	44,924	5,873	37,412	145	855	639
1965	13,150	1,739	10,935	57	217	202	46,328	6,145	38,504	201	767	711
1966	14,431	1,838	12,081	84	196	232	49,159	6,316	41,092	289	674	789
1967	15,310	1,934	12,841	90	204	241	50,577	6,425	42,380	299	678	795
1968	16,178	1,952	13,663	96	212	255	51,011	6,256	42,965	308	679	802
1969	16,873	1,856	14,403	107	240	267	50,639	5,659	43,123	326	732	799
1970	16,865	2,175	14,038	112	252	288	48,037	6,286	39,881	324	728	818
1971	17,265	2,340	14,315	112	246	252	45,697	6,446	38,585	309	678	679
1972	18,664	2,605	15,445	84	288	242	48,224	6,819	39,807	220	754	624
1973	20,175	2,674	16,793	118	294	296	49,054	6,652	40,651	294	731	717
1974	21,331	2,641	17,900	133	297	360	47,761	6,099	39,866	307	686	802
1975	22,673	2,890	18,887	148	345	403	46,314	6,071	38,388	311	725	819
1976	24,934	2,890	21,066	164	400	414	47,817	5,645	40,279	320	781	792
1977	27,478	3,054	23,278	200	494	452	49,216	5,513	41,642	361	892	809
1978	30,895	3,590	25,969	308	531	497	51,322	6,023	43,066	517	891	824
1979	35,395	3,937	29,843	437	574	604	54,061	6,085	45,492	675	887	921
1980	40,551	3,966	34,730	497	693	665	56,669	5,618	48,438	704	982	927
1981	45,902	4,392	39,497	523	795	695	58,280	5,645	50,060	672	1,022	881
1982	51,428	4,947	44,423	587	726	745	61,388	5,917	53,011	702	868	889
1983	57,236	5,872	49,118	590	801	855	65,657	6,749	56,328	678	921	981
1984	65,848	6,808	56,427	634	924	1,055	72,371	7,490	62,008	697	1,017	1,159
1985	74,281	7,889	63,122	713	1,172	1,385	78,698	8,366	66,867	756	1,243	1,467
1986	75,862	8,375	64,016	808	1,458	1,205	78,266	8,625	66,064	832	1,502	1,244
1987	79,664	7,975	68,019	849	1,641	1,180	79,664	7,975	68,019	849	1,641	1,180
1988	84,640	8,943	71,767	1,053	1,757	1,120	81,496	8,632	69,073	1,016	1,696	1,078
1989	87,456	9,139	74,148	1,131	1,778	1,260	80,635	8,446	68,339	1,045	1,643	1,161
1990	94,400	10,049	79,814	1,297	1,780	1,460	83,453	8,972	70,445	1,158	1,589	1,289
1991	94,754	8,699	81,357	1,498	1,560	1,640	80,650	7,454	69,181	1,284	1,337	1,395
1992	98,275	9,074	84,345	1,576	1,470	1,810	81,353	7,555	69,764	1,312	1,224	1,497
1993	98,455	9,196	84,400	1,634	1,395	1,830	79,761	7,476	68,340	1,328	1,134	1,482
1994	100,360	9,600	85,800	1,640	1,380	1,940	79,643	7,656	68,041	1,308	1,100	1,538

[1] See table B-1 for GDP implicit price deflators used to convert current dollars to constant 1987 dollars.

KEY: U&C = Universities and colleges
FFRDCs = Federally Funded Research and Development Centers

NOTE: Data are preliminary for 1993 and estimated for 1994.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry: 1992;* NSF/SRS, *Academic Science/Engineering: R&D Expenditures, Fiscal Year 1993;* NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1993, 1994 and 1995.*

Table B–14.

Trends in Federal and non-Federal R&D expenditures: 1953–94

Year	Total	Federal: Defense related	Federal: Space related	Federal: Civilian related	Non-federal
	Percent				
1953	53.7	48.0	1.0	4.7	46.3
1954	55.5	49.0	1.0	5.5	44.5
1955	56.7	48.2	1.0	7.6	43.3
1956	58.0	49.2	1.0	7.8	42.0
1957	62.5	52.9	0.9	8.7	37.5
1958	63.3	52.6	1.1	9.6	36.7
1959	65.1	54.0	2.5	8.5	34.9
1960	64.6	52.2	3.2	9.2	35.4
1961	64.6	50.0	5.5	9.1	35.4
1962	64.4	48.8	6.6	9.1	35.6
1963	65.7	41.4	13.5	10.9	34.3
1964	66.5	36.8	18.9	10.8	33.5
1965	64.9	33.1	20.8	11.1	35.1
1966	63.9	32.3	19.5	12.1	36.1
1967	62.2	35.2	14.3	12.7	37.8
1968	60.7	34.7	13.6	12.4	39.3
1969	58.1	34.4	11.4	12.3	41.9
1970	57.0	33.3	10.3	13.3	43.0
1971	56.1	32.5	9.5	14.0	43.9
1972	55.5	32.8	7.9	14.9	44.5
1973	53.4	31.9	6.7	14.8	46.6
1974	51.3	28.9	6.9	15.5	48.7
1975	51.4	27.4	7.4	16.6	48.6
1976	51.0	26.7	7.6	16.7	49.0
1977	50.5	26.9	6.6	17.0	49.5
1978	49.6	25.7	6.2	17.8	50.4
1979	48.8	24.6	5.5	18.6	51.2
1980	47.1	24.1	5.3	17.7	52.9
1981	46.5	24.3	5.2	17.0	53.5
1982	45.7	25.9	4.9	14.9	54.3
1983	45.8	27.5	4.2	14.1	54.2
1984	45.1	28.5	3.0	13.7	54.9
1985	45.6	29.8	3.1	12.9	54.2
1986	45.4	30.9	3.0	11.5	54.6
1987	46.2	31.3	3.1	11.8	53.8
1988	44.8	29.5	3.4	11.9	55.2
1989	42.5	[illegible]	3.7	11.7	57.5
1990	40.6	25.1	4.2	11.3	59.4
1991	37.6	22.3	4.5	10.8	62.4
1992	36.1	21.2	4.2	10.7	63.9
1993	36.2	21.2	4.1	10.9	63.8
1994	36.0	20.4	4.4	11.2	64.0

NOTES: Data are estimated for 1993 and 1994. Details may not sum to totals because of rounding.

SOURCE: National Science Foundation/SRS

Table B–15.

National expenditures for R&D as a percentage of gross domestic product, by source of funds: 1953–94

Year	Total R&D/GDP	Federal R&D/GDP	Nonfederal R&D/GDP
	Percent		
1953	1.38	0.74	0.64
1954	1.52	0.84	0.68
1955	1.53	0.87	0.66
1956	1.96	1.14	0.82
1957	2.18	1.36	0.82
1958	2.36	1.49	0.86
1959	2.50	1.63	0.87
1960	2.63	1.70	0.93
1961	2.69	1.74	0.95
1962	2.69	1.73	0.96
1963	2.83	1.86	0.97
1964	2.91	1.93	0.97
1965	2.85	1.85	1.00
1966	2.84	1.81	1.02
1967	2.84	1.77	1.07
1968	2.77	1.68	1.09
1969	2.67	1.55	1.12
1970	2.59	1.47	1.11
1971	2.43	1.36	1.07
1972	2.36	1.31	1.05
1973	2.28	1.22	1.06
1974	2.25	1.16	1.10
1975	2.22	1.14	1.08
1976	2.21	1.13	1.08
1977	2.17	1.09	1.07
1978	2.16	1.07	1.09
1979	2.21	1.08	1.13
1980	2.31	1.09	1.22
1981	2.37	1.10	1.27
1982	2.54	1.16	1.38
1983	2.62	1.20	1.42
1984	2.68	1.21	1.47
1985	2.82	1.29	1.53
1986	2.80	1.27	1.53
1987	2.76	1.28	1.49
1988	2.71	1.22	1.50
1989	2.68	1.14	1.54
1990	2.73	1.11	1.62
1991	2.80	1.05	1.74
1992	2.77	1.00	1.77
1993	2.67	0.97	1.70
1994	2.56	0.92	1.64

Note: Data are preliminary for 1993 and estimated for 1994.

SOURCES: National Science Foundation/SRS and U.S. Department of Commerce.

Table B–16.
Scientists and engineers primarily engaged in R&D activities, by sector of employment: 1985, 1987, 1989, and 1991.

Year	1985	1987	1989	1991
	Thousands			
United States R&D S&Es, total	801.9	877.8	924.2	960.5
Industry, total [1]	646.8	702.2	733.1	776.4
In selected industries (SIC code):				
Food and tobacco products (20,21)	(S)	(S)	(S)	9.6
Petroleum refining and extraction (13,29)	12.0	9.7	10.9	11.5
Chemicals and allied products (28)	73.5	75.5	79.4	83.6
Machinery (35)	85.7	97.1	106.9	104.5
Electrical equipment (36)	115.6	131.5	113.9	93.9
Transportation equipment (37)	169.8	187.8	177.8	145.4
Nonmanufacturing industries	71.0	99.2	(S)	186.3
All other industries	119.4	101.6	244.2	141.6
Federal Government, total [2]	52.1	54.3	58.8	58.3
Work activity classification:				
Research	22.3	22.4	24.6	25.2
Development	29.7	31.9	34.2	33.1
Educational institutions	95.2	112.4	123.1	117.1
Scientists and engineers, total [3]	64.7	77.3	83.5	74.6
By primary work activity:				
Basic research	43.6	48.4	52.7	46.3
Applied research	15.7	24.1	26.0	23.3
Development/design	1.4	0.8	0.9	1.1
Management/administration of R&D	4.0	3.9	3.9	3.9
Graduate students, total [4]	30.5	35.1	39.5	42.5
Nonprofit organizations, total [3]	7.8	8.9	9.2	8.7
By primary work activity:				
Basic research	3.4	3.4	3.8	3.2
Applied research	2.2	3.4	3.2	3.2
Development/design	0.5	0.4	0.5	0.6
Management/administration of R&D	1.7	1.7	1.7	1.7
United States labor force, total [5]	117,167	121,602	125,557	126,867
Ratio of R&D S&Es per 10,000 labor force	68.4	72.2	73.6	75.7

[1] Industry counts are for the average number of full-time equivalent R&D S&Es.

[2] Federal Government counts are for the number of S&Es whose work activity is classified as research or development.

[3] S&E counts for educational institutions and nonprofit organizations are for the number of employed doctoral S&Es who report their primary work activity as research, development or the management of R&D.

[4] Number of full-time equivalent graduate students with research assistantships averaging an estimated 50 percent of their time engaged in R&D activities.

[5] Total labor force of the noninstitutional population, age 16 years and over.

KEY: S&Es = scientists and engineers
S = data have been withheld due to imputation of 50 percent or more

NOTE: The methodology for estimating R&D scientists and engineers was changed for 1985 and later years. These data are not strictly comparable with estimates previously published. See appendix A for a discussion of these changes.

SOURCE: NSF/SRS, Survey of Industrial Research and Development; Survey of Doctorate Recipients; Survey of Graduate Students and Postdoctorates in Science and Engineering; U.S. Office of Personnel Management; and Bureau of Labor Statistics, Employment and Earnings (annual).

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Table B–17.

Geographic distribution of U.S. R&D expenditures, by performer and source of funds: 1991

(page 1 of 2)

			Industry			Universities & colleges							
				Sources			Sources						
Geographic area	United States	Federal Govt.[1]	Total used	Federal Govt.	Industry[2]	Total used[3]	Federal Govt.	Nonfed. govt.	Industry	U&C	All other	U&C FFRDCs[4]	Non-profits[5]
	Millions of dollars												
Total, U.S.	160,157	15,238	116,952	26,372	90,580	17,638	10,226	1,484	1,210	3,404	1,313	5,079	5,250
New England	11,625	658	8,408	2,013	6,395	1,507	1,029	34	124	180	140	389	664
Connecticut	1,913	47	1,535	504	1,031	317	197	6	16	70	28	0	15
Maine	NA	14	0–284	0–18	0–266	27	10	2	5	10	1	0	16
Massachusetts	8,561	278	6,335	1,480	4,855	949	679	13	91	66	100	389	610
New Hampshire	NA	88	102–120	0–18	102	79	53	4	4	10	8	0	0
Rhode Island	485	226	152	11	141	88	60	5	4	18	2	0	18
Vermont	NA	5	0–284	0–18	0–266	47	31	3	4	6	2	0	5
Middle Atlantic	26,752	1,002	22,340	4,473	17,867	2,689	1,634	147	205	438	265	402	320
New Jersey	8,768	513	7,810	855	6,955	342	148	43	19	107	25	91	12
New York	10,363	174	8,268	1,558	6,710	1,467	934	77	85	191	180	284	170
Pennsylvania	7,621	315	6,262	2,060	4,202	879	553	27	100	140	60	27	138
South Atlantic	19,384	7,001	8,593	2,520	6,073	3,205	1,907	310	241	603	145	51	535
Delaware	NA	9	863–995	D	D	45	20	4	5	13	3	0	3
D.C.	1,737	1,433	40	16	24	118	87	0	7	13	11	0	145
Florida	3,700	658	2,599	934	1,665	438	221	37	36	116	29	0	5
Georgia	1,479	121	868	89	779	484	238	43	40	150	13	0	6
Maryland	5,864	3,432	1,203	666	537	1,078	785	82	40	140	32	0	151
North Carolina	1,965	151	1,285	4	1,281	502	304	72	55	52	19	0	27
South Carolina	595	14	419	D	D	151	54	17	16	54	10	0	10
Virginia	2,771	1,107	1,115	679	436	338	179	53	31	52	23	29	182
West Virginia	NA	76	69–201	D	69	51	20	2	11	13	4	22	5
Southeast	3,257	1,044	1,453	637	816	680	360	86	52	137	45	10	70
Alabama	1,503	701	521	221	300	245	125	26	20	52	21	0	36
Kentucky	317	62	154	D	D	98	38	6	11	38	5	0	2
Mississipp	299	157	41	D	D	97	49	21	9	12	6	0	4
Tennessee	1,139	124	737	D	D	240	147	33	12	35	13	10	28
Southwest	7,894	525	5,425	1,418	4,007	1,663	712	229	111	419	192	2	280
Arkansas	198	35	106	D	D	55	20	14	5	13	3	0	2
Louisiana	457	43	172	16	156	240	99	62	16	48	15	0	2
Oklahoma	604	41	392	2	390	153	43	14	9	74	13	0	18
Texas	6,635	405	4,755	D	D	1,216	551	139	83	283	160	2	257

(continued)

Table B–17.
Geographic distribution of U.S. R&D expenditures, by performer and source of funds: 1991
(page 2 of 2)

			Industry			Universities & colleges							
				Sources			Sources						
Geographic area	United States	Federal Govt.[1]	Total used	Federal Govt.	Industry[2]	Total used[3]	Federal Govt.	Nonfed. govt.	Industry	U&C	All other	U&C FFRDCs[4]	Non-profits[5]
	Millions of dollars												
Great Lakes	25,163	973	20,997	1,307	19,690	2,457	1,318	230	176	524	209	574	163
Illinois	6,417	68	5,027	190	4,837	702	362	53	50	181	57	574	47
Indiana	2,347	92	1,988	226	1,762	262	144	20	20	61	17	0	4
Michigan	8,851	92	8,116	89	8,027	601	310	40	50	155	46	0	42
Ohio	5,975	689	4,726	778	3,948	504	285	53	38	74	54	0	57
Wisconsin	1,573	32	1,140	24	1,116	388	218	64	19	53	34	0	13
Plains	5,807	206	4,298	804	3,494	1,191	567	179	84	282	80	26	86
Iowa	777	27	461	D	D	259	124	34	14	74	13	26	3
Kansas	NA	12	0–1,963	D	D	124	44	29	7	40	4	0	5
Minnesota	2,228	41	1,810	150	1,660	332	165	54	19	61	33	0	46
Missouri	NA	71	0–1,963	D	D	306	165	19	30	67	24	0	22
Nebraska	211	22	59	7	52	124	41	36	10	33	5	0	6
North Dakota	NA	24	0–1,963	D	D	31	21	1	2	5	1	0	1
South Dakota	32	9	5	0	5	16	7	7	0	2	1	0	2
Mountain	8,550	1,085	5,185	2,156	3,029	1,080	629	74	77	243	57	1,053	147
Arizona	1,399	132	944	199	745	284	132	8	20	109	16	27	11
Colorado	NA	275	1,751–2,593	0–842	1,751	262	186	13	18	25	20	78	106
Idaho	NA	37	0–985	0–842	0–143	42	16	9	5	12	0	0	1
Montana	NA	26	0–985	0–842	0–143	38	14	9	4	11	0	0	1
Nevada	261	109	83	63	20	67	38	3	5	20	1	0	3
New Mexico	2,582	393	1,064	1,001	63	163	93	15	16	27	12	948	15
Utah	665	103	356	51	305	202	138	17	7	34	6	0	4
Wyoming	41	9	2	0	2	23	13	2	2	6	0	0	7
Pacific	33,118	2,166	24,872	9,739	15,133	2,812	1,873	150	123	486	179	2,563	703
Alaska	146	59	18	D	D	67	34	2	2	26	1	0	2
California	28,337	1,885	21,279	8,911	12,368	2,137	1,432	84	86	387	148	2,563	473
Hawaii	145	45	11	D	D	78	45	27	1	3	2	0	11
Oregon	600	47	349	21	321	179	109	26	7	21	16	0	24
Washington	3,890	133	3,215	D	D	350	253	11	28	45	12	0	193
Other/unknown	18,607	577	15,381	1,305	14,076	357	197	45	18	95	1	9	2,284

[1] Total funds used by the Federal Government are from Federal sources.

[2] Industry R&D expenditures include all nonfederal sources of funds. For some States, industry sector data fall within the range specified but have been withheld by the Census Bureau to avoid disclosing individual company operations.

[3] For universities and colleges, funds distributed by State and region are for doctorate-granting institutions only.

[4] Includes R&D expenditures of university-associated FFRDCs, of which 99 percent were from Federal sources.

[5] For the nonprofit sector, funds distributed by State and region include only Federal obligations to organizations in this sector. Estimated nonfederal support to the nonprofit sector is included in other/unknown.

KEY: D = withheld to avoid disclosing operations of individual companies
FFRDC = federally funded research and development center
U&C = universities and colleges
NA = not available because of the range in industy's R&D performance

SOURCE: National Science Board, *Science & Engineering Indicators—1993* (Washington, DC: GPO, 1993) (NSB 93-1)

Table B–18.

Employed doctoral scientists and engineers, by field of doctorate and primary work activity: 1991

		Research & Development				Management/Admin.						
Field of doctorate	Total employment	Total	Basic	Applied	Develop/ design	Total	of R&D	of other	Teaching	Prof. services	Con- sulting	Other/no response
Total	437,206	157,338	61,015	71,697	24,626	68,362	33,385	34,977	99,199	39,991	19,234	53,082
Sciences	367,440	126,617	57,271	56,073	13,273	55,257	24,657	30,600	87,353	39,594	13,873	44,746
Physical sciences	80,872	38,708	12,060	19,770	6,878	14,388	10,260	4,128	13,288	1,127	2,660	10,701
Chemistry	48,967	22,354	5,883	12,778	3,693	9,266	6,600	2,666	7,755	618	1,875	7,099
Physics/Astronomy	31,905	16,354	6,177	6,992	3,185	5,122	3,660	1,462	5,533	509	785	3,602
Mathematical sciences	20,049	5,909	2,825	2,062	1,022	1,851	612	1,239	8,996	164	620	2,509
Mathematics	16,546	4,799	2,377	1,461	961	1,500	441	1,059	7,789	164	432	1,862
Statistics/Probability	3,503	1,110	448	601	61	351	171	180	1,207	N	188	647
Computer/Information spec	5,376	2,745	890	1,131	724	769	452	317	990	45	106	721
Environmental sciences	13,263	5,631	2,621	2,815	195	2,045	1,205	840	2,797	108	977	1,705
Earth sciences	9,745	3,605	1,583	1,905	117	1,561	936	625	2,341	88	716	1,434
Oceanography	1,920	1,199	696	465	38	177	97	80	236	20	151	137
Atmospheric sciences	1,598	827	342	445	40	307	172	135	220	N	110	134
Life sciences	113,743	52,122	30,144	19,149	2,829	17,235	8,710	8,525	20,207	7,457	3,332	13,390
Biological sciences	78,059	37,914	25,294	11,024	1,596	10,896	5,880	5,016	14,338	4,671	1,874	8,366
Agricultural sciences	16,637	7,413	1,804	4,858	751	2,637	1,206	1,431	2,257	359	748	3,223
Medical sciences	19,047	6,795	3,046	3,267	482	3,702	1,624	2,078	3,612	2,427	710	1,801
Psychology	65,672	8,455	3,754	3,801	900	8,102	1,292	6,810	11,220	29,347	2,947	5,601
Social sciences	68,465	13,047	4,977	7,345	725	10,867	2,126	8,741	29,855	1,346	3,231	10,119
Economics	19,241	4,954	1,534	3,189	231	2,653	664	1,989	7,593	118	1,200	2,723
Sociology/Anthropology	18,094	3,329	1,470	1,785	74	3,056	640	2,416	8,259	471	490	2,489
Other social sciences	31,130	4,764	1,973	2,371	420	5,158	822	4,336	14,003	757	1,541	4,907
Engineering	69,766	30,721	3,744	15,624	11,353	13,105	8,728	4,377	11,846	397	5,361	8,336
Aeronautical/Astronautical	3,087	1,641	193	875	573	549	506	43	570	15	142	170
Chemical	10,633	5,122	487	2,762	1,873	2,218	1,339	879	1,149	53	638	1,453
Civil	7,512	1,763	218	1,072	473	1,184	635	549	2,126	60	1,490	889
Electrical/Electronic	16,994	8,405	798	3,764	3,843	3,379	2,368	1,011	2,872	69	872	1,397
Materials science	6,230	3,233	456	1,798	979	1,212	943	269	490	N	296	999
Mechanical	8,680	3,761	501	1,684	1,576	1,592	1,144	448	1,669	31	518	1,109
Nuclear	1,903	907	100	475	332	326	296	30	144	4	151	371
Systems design	1,561	695	81	365	249	252	176	76	305	N	173	136
Other	13,166	5,194	910	2,829	1,455	2,393	1,321	1,072	2,521	165	1,081	1,812

KEY: N = No cases reported (see NOTE below)

NOTE: All numbers in the table are estimates derived from a sample.

SOURCE: National Science Foundation/SRS, 1991 Survey of Doctorate Recipients [National Research Council]

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Table B-19.
Scientists and engineers engaged in R&D: total and per 10,000 labor force population, by country: 1970–92

Year	United States	Japan	Germany	France	United Kingdom	Italy	United States	Japan	Germany	France	United Kingdom	Italy
	Thousands						Per 10,000 labor force					
1970	543.8	172.0	82.5	58.5	NA	27.6	64.1	33.4	30.8	27.3	NA	13.2
1971	523.5	194.3	90.2	60.1	NA	30.9	60.6	37.5	33.4	27.9	NA	14.8
1972	515.0	198.1	96.0	61.2	76.7	32.6	58.0	38.1	35.6	28.2	30.4	15.7
1973	514.6	226.6	101.0	62.7	NA	33.3	56.4	42.5	37.1	28.5	NA	16.0
1974	520.6	238.2	102.5	64.1	NA	34.3	55.6	44.9	37.8	28.8	NA	16.3
1975	527.4	253.6	103.7	65.3	80.5	37.9	55.3	45.6	38.6	29.2	31.1	17.9
1976	535.2	263.2	104.5	67.0	NA	37.9	54.7	47.0	39.2	29.6	NA	17.6
1977	560.6	264.8	111.0	68.0	NA	39.7	55.7	47.1	41.8	29.7	NA	18.2
1978	586.6	272.8	113.9	70.9	87.7	40.8	56.5	48.3	42.7	30.7	33.3	18.6
1979	614.5	291.2	116.9	72.9	NA	46.4	57.7	51.3	43.4	31.4	NA	20.8
1980	651.1	303.2	120.7	74.9	NA	47.0	60.0	53.1	44.3	32.1	NA	20.8
1981	683.2	311.0	124.7	85.5	95.7	52.1	61.9	54.5	44.0	36.3	35.8	22.9
1982	711.8	321.0	NA	90.1	NA	56.7	63.6	55.6	NA	37.9	NA	24.9
1983	751.6	347.4	130.8	92.7	94.1	63.0	66.4	59.0	45.7	39.1	35.4	27.3
1984	NA	357.4	NA	98.2	96.3	62.0	NA	60.3	NA	41.1	35.5	26.6
1985	801.9	380.3	143.6	102.3	124.8	63.8	68.4	63.9	49.7	42.8	45.0	27.1
1986	NA	393.0	NA	105.0	128.2	67.8	NA	65.3	NA	43.8	46.0	28.4
1987	877.8	415.6	165.6	109.4	128.2	70.6	72.2	68.8	56.4	45.4	48.0	29.4
1988	NA	434.6	NA	115.2	130.2	74.9	NA	70.5	NA	47.6	48.0	30.9
1989	924.2	457.5	176.4	120.4	134.0	76.1	73.6	73.0	59.2	49.6	47.0	31.4
1990	NA	477.9	NA	123.9	130.0	77.9	NA	74.9	NA	50.8	46.0	31.8
1991	960.4	491.1	NA	129.2	126.0	75.2	75.7	75.5	NA	52.5	45.0	30.6
1992	NA	511.4	NA	NA	123.0	NA	NA	78.0	NA	NA	NA	NA

KEY: NA = not available

NOTES: Table includes scientists and engineers (S&Es) engaged in R&D on a full-time equivalent (FTE) basis with the following exceptions: Japanese data include persons primarily employed in R&D in the natural sciences and engineering; and the U.S. data are a mix of S&Es engaged in R&D on an FTE basis and counts of S&Es whose primary work activity is R&D. The United Kingdom data exclude the private nonprofit sector (about 2–5 percent of total). As a result of ongoing improvements in methodology and measurement, there are several major breaks in the continuity of the following time series: Japan (1974–75), Germany (1978–79), France (1980–81), the United Kingdom (1984–85), and the United States (1984–85 and 1991–92).

SOURCES: National Science Foundation/SRS, Organisation for Economic Co-operation and Development

Table B–20.

National expenditures for the performance of R&D as a percentage of GDP, by country: 1970–93

Year	Total R&D							Nondefense R&D						
	United States	Japan	Germany	France	United Kingdom	Italy	Canada	United States	Japan	Germany	France	United Kingdom	Italy	Canada
	Percent													
1970	2.59	1.71	2.06	1.89	NA	0.83	1.20	1.80	NA	1.89	NA	NA	0.81	NA
1971	2.43	1.75	2.20	1.88	NA	0.85	1.27	1.69	1.74	2.05	1.44	NA	0.84	1.21
1972	2.36	1.79	2.21	1.85	2.05	0.86	1.25	1.62	1.78	2.09	1.46	1.50	0.84	1.20
1973	2.28	1.82	2.10	1.75	NA	0.81	1.14	1.61	1.81	1.95	1.37	NA	0.80	1.09
1974	2.25	1.87	2.13	1.77	NA	0.82	1.10	1.63	1.86	1.99	1.41	NA	0.80	1.05
1975	2.22	1.91	2.24	1.79	2.05	0.84	1.09	1.61	1.90	2.10	1.44	1.42	0.83	1.06
1976	2.21	1.83	2.16	1.75	NA	0.77	1.03	1.62	1.82	2.02	1.42	NA	0.76	1.00
1977	2.17	1.81	2.15	1.73	NA	0.79	1.05	1.57	1.80	2.02	1.41	NA	0.77	1.02
1978	2.16	1.82	2.25	1.73	2.10	0.74	1.07	1.58	1.81	2.12	1.38	1.49	0.72	1.03
1979	2.21	1.90	2.37	1.78	NA	0.74	1.09	1.65	1.89	2.23	1.40	NA	0.73	1.06
1980	2.31	2.01	2.45	1.82	NA	0.75	1.14	1.76	2.00	2.33	1.41	NA	0.74	1.11
1981	2.37	2.13	2.43	1.97	2.37	0.87	1.23	1.76	2.12	2.33	1.48	1.75	0.84	1.20
1982	2.54	2.22	2.52	2.06	NA	0.90	1.38	1.84	2.21	2.42	1.59	NA	0.88	1.34
1983	2.62	2.35	2.52	2.11	2.19	0.95	1.35	1.89	2.34	2.41	1.66	1.61	0.92	1.31
1984	2.68	2.43	2.51	2.21	NA	1.01	1.38	1.90	2.41	2.40	1.74	NA	0.96	1.34
1985	2.82	2.58	2.72	2.25	2.27	1.13	1.43	1.98	2.56	2.58	1.78	1.68	1.06	1.39
1986	2.80	2.56	2.73	2.23	2.29	1.13	1.47	1.94	2.54	2.59	1.75	1.75	1.07	1.42
1987	2.76	2.63	2.88	2.27	2.22	1.19	1.42	1.90	2.61	2.74	1.78	1.75	1.14	1.37
1988	2.71	2.67	2.86	2.28	2.18	1.22	1.37	1.89	2.65	2.73	1.77	1.78	1.13	1.33
1989	2.68	2.80	2.87	2.33	2.20	1.24	1.36	1.91	2.77	2.74	1.83	1.80	1.16	1.32
1990	2.73	2.89	2.75	2.42	2.19	1.30	1.45	2.01	2.87	2.61	1.85	1.81	1.25	1.41
1991	2.80	2.87	2.65	2.42	2.13	1.32	1.50	2.11	2.84	2.53	1.92	1.73	1.26	1.46
1992	2.77	2.80	2.53	2.36	2.12	1.38	1.51	2.10	2.77	2.42	1.92	1.71	1.33	1.47
1993	2.67	NA	NA	NA	NA	1.40	1.50	2.02	NA	NA	NA	NA	1.35	NA

KEY: NA = not available

SOURCES: National Science Foundation/SRS, Organisation for Economic Co-operation and Development, and national sources

Table B–21.
Federal R&D budget authority, by budget function: fiscal years 1978–95

Budget function	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993[2]	est. 1994[2]	proposed 1995
	Millions of dollars																	
Total	25,976	28,208	29,739	33,735	36,115	38,768	44,214	49,887	53,249	57,069	59,106	62,115	63,781	65,898	68,398	69,884	68,311	71,361
National defense	2,899	13,791	14,946	18,413	22,070	24,936	29,287	33,698	36,926	39,152	40,099	40,665	39,925	39,328	40,061	41,249	38,020	39,496
Health	2,968	3,401	3,694	3,871	3,869	4,298	4,779	5,418	5,565	6,556	7,076	7,773	8,308	9,226	10,055	10,280	10,936	11,417
Space research and technolog	2,939	3,136	2,738	3,111	2,584	2,134	2,300	2,725	2,894	3,398	3,683	4,555	5,765	6,511	6,744	6,988	7,212	7,665
Energy	3,134	3,461	3,603	3,501	3,012	2,578	2,581	2,389	2,315	2,115	2,155	2,436	2,726	2,953	3,153	2,677	2,854	2,943
General science	1,050	1,119	1,233	1,340	1,359	1,502	1,676	1,862	1,873	2,042	2,160	2,373	2,410	2,635	2,659	2,691	2,717	2,866
Natural resources and environment	904	1,010	999	1,061	965	952	963	1,059	1,062	1,133	1,160	1,255	1,386	1,582	1,688	1,802	1,992	1,998
Transportation	768	798	887	869	791	876	1,040	1,030	917	908	896	1,064	1,045	1,231	1,523	1,703	1,892	1,999
Agriculture	501	552	585	659	693	745	762	836	815	822	882	907	950	1,052	1,155	1,152	1,188	1,190
Education, training, employment and social services	345	354	468	298	228	189	200	220	248	267	285	347	374	433	365	348	349	364
International affair	57	117	125	160	165	177	192	210	211	223	224	279	375	378	371	382	321	314
Veterans benefits and services	111	123	126	143	139	157	218	193	183	215	195	212	216	219	245	250	270	231
Commerce and housing credit	77	93	101	106	104	107	110	114	111	110	122	128	140	178	192	220	375	694
Community and regional development	92	127	119	104	63	44	46	50	59	37	79	57	67	88	95	57	72	81
Administration of justice	44	47	45	34	31	37	24	47	41	49	51	45	44	51	51	49	51	50
Income security	67	57	47	43	32	32	26	21	14	25	23	27	33	30	37	36	61	50
General government	20	23	22	22	10	6	8	17	14	17	17	15	17	4	4	(1)	1	0

[1] Less than $500,000

[2] Fiscal year 1993 and 1994 estimates reflect rescissions and supplementals enacted in Public Law 103-211.

NOTE: Data for 1990–93 are actual budget authority. Data for 1994 are estimated, and data for 1995 are proposed based on the fiscal year 1995 budget.

SOURCE: Agencies' submissions to Office of Management and Budget Circular No. A-11 44A, Research and Development Activities; agency budget justification documents; and supplemental data obtained from the agencies' budget offices.

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Table B–22.
Federal obligations for research and development, by agency: fiscal years 1984–94
(page 1 of 2)

Agency and subdivision										Estimates	
	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
	Millions of dollars										
Total, all agencies	42,224.9	48,359.6	51,412.4	55,253.7	56,769.4	61,406.5	63,559.5	61,295.2	65,592.6	71,445.1	71,243.7
Department of Agriculture, total	866.2	943.0	928.5	947.9	1,016.6	1,038.3	1,108.4	1,236.6	1,327.1	1,330.6	1,367.9
Agricultural Research Svc	451.3	469.7	463.4	478.6	505.7	523.5	545.5	591.0	627.1	626.2	640.2
Cooperative State Rsch Svc	235.7	284.3	269.0	270.7	298.4	307.3	324.2	376.8	418.2	418.6	416.5
Forest Service	108.4	113.1	113.3	126.7	135.5	131.4	158.6	174.7	180.7	186.7	215.2
Other	70.8	75.9	82.8	71.9	77.0	76.1	80.1	94.1	101.1	99.1	96.0
Department of Commerce, total	358.2	398.8	399.2	402.2	388.9	[illegible]	438.2	489.6	651.2	736.0	896.8
National Institute of Standards & Technology	95.5	100.5	100.8	98.6	107.9	115.5	122.3	140.0	179.0	261.2	381.6
National Oceanic & Atmospheric Administration	244.3	269.8	274.7	286.1	263.0	268.6	300.1	338.0	462.4	465.5	504.2
Other	18.4	28.5	23.7	17.5	18.0	13.8	15.8	11.6	9.8	9.3	11.0
Department of Defense, total	25,372.9	29,791.5	32,937.9	35,231.5	35,248.9	37,576.9	37,268.1	32,134.8	36,129.5	38,986.9	37,522.9
Department of the Army	4,225.5	4,570.8	4,809.4	5,019.5	4,806.0	5,659.3	5,684.1	6,081.5	6,854.2	6,403.6	5,608.3
Department of the Navy	7,605.6	9,127.4	9,650.3	9,507.8	9,514.1	9,666.1	9,586.2	7,806.0	8,030.8	10,206.0	9,370.0
Department of the Air Force	12,091.6	13,260.9	13,593.8	15,347.7	14,867.3	15,237.4	14,831.4	10,937.5	13,427.1	13,889.0	13,994.3
Defense agencies	1,391.5	2,781.7	4,767.4	5,219.7	5,832.9	6,858.9	6,945.2	7,072.5	7,571.7	8,234.6	8,267.1
Operational Test & Evaluation, Director	NA	NA	0.0	8.4	68.2	14.4	32.6	13.6	12.4	12.0	12.6
Test & Evaluation, Deputy Under Secretary Defense	58.6	50.6	117.1	128.5	160.3	140.7	188.7	223.7	233.2	241.6	270.6
Department of Education	115.7	124.9	121.3	132.5	140.7	159.1	169.9	171.0	168.5	176.7	185.6
Department of Energy	4,673.6	4,966.0	4,688.3	4,757.2	5,036.4	5,192.6	5,630.6	5,983.1	6,172.2	6,586.1	6,581.9
Department of Health & Human Services, total	4,830.7	5,451.0	5,657.6	6,606.3	7,158.0	7,902.8	8,405.6	9,756.0	8,987.8	10,343.7	10,722.5
Alcohol, Drug Abuse, & Mental Health Administration	337.2	377.6	396.1	475.5	554.8	695.7	842.7	1,460.6	NA	NA	NA
Centers for Disease Control	46.3	47.6	52.2	66.2	88.7	117.8	95.6	113.4	146.9	149.5	183.1
Food & Drug Administration	77.8	82.1	79.4	85.0	91.0	99.0	99.0	125.0	135.7	139.1	151.2
Nat'l Institutes of Health [1]	4,257.4	4,827.7	5,005.1	5,850.9	6,290.9	6,778.3	7,136.5	7,695.5	8,409.2	9,771.1	10,075.1
Other	112.0	116.0	124.8	128.7	132.6	212.0	231.8	361.5	296.0	284.0	313.1
Department of Housing & Urban Development	18.2	18.5	15.3	16.3	18.4	18.0	19.3	27.8	25.1	26.4	35.5
Department of the Interior, total	410.9	391.7	385.2	403.8	416.8	469.0	508.5	592.9	609.2	612.2	588.5
Bureau of Mines	108.8	89.9	84.4	88.8	91.3	98.7	99.3	106.1	107.1	116.1	90.8
Geological Survey	208.9	214.9	218.6	226.8	236.1	279.9	308.4	356.6	361.4	355.0	361.9
US Fish & Wildlife Service	59.1	49.0	47.0	53.3	59.2	60.6	69.4	81.0	85.1	84.1	107.3
Other	34.1	37.9	35.2	34.9	30.2	29.8	31.4	49.2	55.6	57.0	28.5
Department of Justice, total	24.5	36.0	36.5	42.4	43.1	38.2	40.5	48.9	48.0	45.9	45.8
Department of Labor, total	16.3	13.3	10.4	21.6	35.6	35.4	73.0	44.0	51.7	65.3	65.6
Department of State, total	1.6	1.5	1.5	3.0	4.2	4.7	4.7	5.9	5.6	5.4	5.4

(continued)

Table B-22.
Federal obligations for research and development, by agency: fiscal years 1984–94
(page 2 of 2)

Agency and subdivision	1984	1985	1986	1987	1988	1989	1990	1991	1992	Estimates 1993	Estimates 1994
	Millions of dollars										
Department of Transportation, total	448.3	428.9	385.5	325.0	304.6	303.3	366.6	379.9	445.0	747.4	687.8
Federal Aviation Admin	266.2	266.3	260.6	167.3	160.5	146.8	216.1	220.1	236.2	270.2	272.1
Federal Highway Admin	46.4	49.0	45.5	76.7	74.1	91.0	91.5	86.9	130.2	334.7	263.7
Federal Railroad Admin	19.2	15.0	15.4	11.2	10.0	9.0	10.2	15.9	22.7	36.2	61.1
National Highway Traffic Safety Administration	56.9	28.1	22.4	27.9	28.3	29.7	16.9	21.4	25.8	31.6	27.0
Other	59.6	50.5	41.6	41.9	31.7	26.8	31.9	35.6	30.1	74.7	63.9
Department of the Treasury, total	13.9	24.3	24.0	26.9	26.1	25.6	25.6	30.8	24.6	16.6	27.7
Department of Veterans Affairs	90.3	226.6	186.2	209.5	215.3	234.7	237.7	216.6	223.9	242.7	206.0
Agency for International Development	37.2	220.4	251.2	217.5	204.4	279.1	334.6	377.7	365.9	381.0	421.6
Environmental Protection Agency	261.2	320.4	317.3	348.2	347.4	380.3	419.7	432.6	483.9	520.7	655.9
National Aeronautics & Space Administration	2,821.9	3,327.2	3,419.8	3,787.1	4,330.4	5,393.5	6,533.2	7,280.2	7,657.6	8,190.3	8,637.0
National Science Foundation	1,202.8	1,345.6	1,353.3	1,470.5	1,532.8	1,670.4	1,689.5	1,785.2	1,868.4	2,072.6	2,217.0
Nuclear Regulatory Commission	190.7	150.0	123.8	122.5	108.5	114.8	108.8	108.8	119.0	119.7	122.1
Smithsonian Institution	63.6	71.1	63.3	71.5	75.1	80.2	84.0	98.0	98.0	100.0	100.9
Tennessee Valley Authority	68.1	79.5	77.5	77.9	87.3	62.6	64.9	68.3	97.3	106.4	117.1
All other agencies	129.3	118.3	113.6	122.5	127.5	150.0	157.5	148.6	153.6	163.3	172.0

[1] Fiscal year 1992 figures include obligations from the Alcohol, Drug Abuse, and Mental Health Administration. Due to reorganization within the Department of Health and Human Services, the Alcohol, Drug Abuse, and Mental Health Administration ceased to exist as of October 1992, and its research and development functions are reported with the National Institutes of Health data.

KEY: NA = Not applicable (indicates that the agency or agency subdivision did not exist as such or in that organization in that year)

SOURCE: National Science Foundation/SRS, Survey of Federal Funds for Research and Development: Fiscal Years 1992, 1993, and 1994

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Table B–23.
Federal obligations for basic research, by selected agency: fiscal years 1984–94
(page 1 of 2)

Selected agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	Estimates 1993	Estimates 1994
	Millions of dollars										
Total, all agencies	7,067.4	7,818.7	8,153.1	8,942.4	9,473.6	10,602.0	11,285.6	12,170.8	12,489.9	13,897.4	14,346.1
Deparment of Agriculture, total	392.6	445.4	432.9	445.5	480.6	484.9	519.2	557.6	595.2	596.9	631.0
Agricultural Research Svc	240.6	250.2	247.7	253.4	271.1	282.7	294.0	309.7	326.1	325.6	334.8
Cooperative State Rsch Svc	99.6	141.5	131.7	132.8	145.8	142.6	153.7	170.4	189.6	189.7	204.9
Forest Service	41.2	44.1	42.2	49.4	51.6	50.0	60.3	66.6	68.9	70.9	81.7
Other											
Department of Commerce, total	20.6	23.2	26.5	25.8	30.9	29.1	31.4	34.3	34.5	37.1	40.4
National Institute of Standards & Technology	20.2	22.1	25.7	25.1	26.3	27.9	28.6	31.9	33.6	36.8	40.1
Other	0.4	1.1	0.8	0.7	4.6	1.2	2.8	2.4	0.9	0.3	0.3
Department of Defense, total	847.9	861.4	923.9	907.6	876.9	947.9	947.6	994.2	1,098.9	1,238.4	1,236.7
Department of the Army	222.1	240.8	248.5	217.0	165.7	187.2	185.1	188.6	204.9	213.3	210.4
Department of the Navy	315.8	343.1	337.3	354.3	341.8	354.0	365.0	388.0	393.8	406.0	433.0
Department of the Air Force	192.4	198.3	216.5	221.6	196.4	202.8	197.0	209.2	205.8	238.5	246.0
Defense agencies	117.6	79.2	121.7	114.8	173.0	203.9	200.5	208.3	294.4	380.6	347.3
Department of Education	12.2	14.6	4.5	3.1	4.4	4.4	4.9	8.6	7.5	6.9	11.1
Department of Energy	830.4	942.6	959.7	1,068.5	1,184.8	1,410.9	1,504.8	1,686.5	1,736.4	1,775.4	1,781.8
Department of Health & Human Services, total	2,814.5	3,232.5	3,338.8	3,827.9	4,081.4	4,388.0	4,649.0	5,050.1	5,058.7	5,883.5	6,066.5
Alcohol, Drug Abuse, & Mental Health Administration	170.8	196.8	203.4	232.2	265.8	308.0	386.2	459.1	NA	NA	NA
Nat'l Institutes of Health [1]	2,624.8	3,018.0	3,118.6	3,575.5	3,795.1	4,053.3	4,261.7	4,589.5	5,057.4	5,882.2	6,065.2
Other	18.9	17.7	16.8	20.2	20.5	26.7	1.1	1.5	1.3	1.3	1.3
Department of the Interior, total	125.9	138.3	133.0	134.9	126.5	188.9	205.4	229.3	230.9	229.3	213.4
Bureau of Mines	40.5	49.9	44.9	45.6	32.1	43.9	40.6	42.8	43.7	45.6	29.0
Geological Survey	78.9	80.5	83.4	84.9	89.5	140.2	159.1	179.1	180.1	177.0	176.1
Other	6.5	7.9	4.7	4.4	4.9	4.8	5.7	7.4	7.1	6.7	8.3
Department of Justice, total	4.7	4.2	5.3	8.1	7.6	6.8	8.8	6.4	5.3	3.7	3.4
Department of Labor, total	5.0	3.3	0.9	1.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2
Department of State, total	0.0	0.0	0.0	2.6	3.1	3.4	3.5	4.6	4.9	4.9	4.9
Department of Transportation, total	3.5	1.1	0.6	0.2	0.0	0.0	0.0	0.0	1.2	3.5	2.3
Department of the Treasury, total	4.0	4.8	5.1	4.7	4.8	3.4	3.4	3.6	3.6	5.8	14.3
Department of Veterans Affairs	15.8	15.4	14.8	17.2	17.3	16.6	16.2	16.1	15.7	14.2	11.9

(continued)

Table B–23.

Federal obligations for basic research, by selected agency: fiscal years 1984–94

(page 2 of 2)

Selected agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	Estimates 1993	Estimates 1994
	Millions of dollars										
Agency for International Development	3.0	1.7	4.3	2.8	3.0	3.1	5.0	5.7	5.8	6.7	5.7
Environmental Protection Agency	29.6	38.6	38.5	31.1	27.2	50.7	73.6	91.2	110.4	114.4	180.0
National Aeronautics & Space Administration	754.5	750.9	916.7	1,013.7	1,112.7	1,417.4	1,636.9	1,705.6	1,738.2	1,952.3	1,991.3
National Science Foundation	1,132.3	1,261.8	1,275.2	1,371.2	1,433.2	1,562.6	1,586.3	1,676.2	1,741.5	1,921.4	2,047.5
Smithsonian Institution	63.6	71.1	63.3	71.5	75.1	80.2	84.0	98.0	98.0	100.0	100.9
Tennessee Valley Authority	5.1	5.5	7.3	3.9	3.2	2.9	4.7	1.9	2.1	2.1	2.1
All other agencies	2.2	2.3	1.8	3.3	3.6	3.9	4.1	5.2	5.8	5.6	5.6

[1] Fiscal year 1992 figures include obligations from the Alcohol, Drug Abuse, and Mental Health Administration. Due to reorganization within the Department of Health and Human Services, the Alcohol, Drug Abuse, and Mental Health Administration ceased to exist as of October 1992, and its research and development functions are reported with the National Institutes of Health data beginning with this volume

NOTES: Because of rounding, detail may not add to totals.

KEY: NA = Not applicable (indicates that the agency or agency subdivision did not exist as such or in that organization in that year)

SOURCE: National Science Foundation/SRS, Survey of Federal Funds for Research and Development: Fiscal Years 1992, 1993, and 1994

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Table B–24.
Federal obligations for applied research, by selected agency: fiscal years 1984–94
(page 1 of 2)

Selected agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	Estimates 1993	Estimates 1994
	Millions of dollars										
Total, all agencies	7,911.4	8,314.7	8,349.1	8,998.1	9,176.5	10,163.5	10,336.8	11,797.6	12,000.7	13,554.5	13,777.7
Department of Agriculture, total	442.2	465.6	463.5	473.4	504.6	517.3	542.1	617.9	665.8	666.9	668.8
Agricultural Research Svc	183.7	191.8	188.3	201.1	208.2	209.4	218.2	241.1	257.1	256.7	261.1
Cooperative State Rsch Svc	136.2	142.8	137.4	138.0	152.6	164.7	170.5	206.4	228.6	228.9	211.6
Economic Research Svc	39.3	41.7	40.1	38.5	41.4	42.6	43.5	46.8	50.6	50.7	44.3
Forest Service	63.9	65.7	67.5	73.5	79.9	77.5	93.5	103.6	106.9	110.3	127.1
Other	19.1	23.6	30.2	22.3	22.5	23.1	16.4	20.0	22.6	20.3	24.7
Department of Commerce, total	276.1	301.0	312.9	312.8	311.5	321.9	345.6	415.4	561.4	595.8	702.8
National Institute of Standards & Technology	63.5	64.5	63.5	64.3	72.6	77.6	83.2	92.5	115.8	163.3	225.4
National Oceanic & Atmospheric Administration	197.7	224.4	237.5	234.4	225.0	234.6	252.4	315.6	438.7	425.7	468.9
Other	14.9	12.1	11.9	14.1	13.9	9.7	10.0	7.3	6.9	6.8	8.5
Department of Defense, total	2,200.7	2,306.9	2,303.3	2,440.0	2,362.2	2,708.2	2,581.6	2,723.8	2,974.5	3,637.4	3,179.2
Department of the Army	486.7	582.6	578.8	692.9	588.0	636.3	595.2	671.9	727.8	856.5	631.4
Department of the Navy	449.6	448.2	447.1	432.5	406.0	429.2	442.6	486.0	499.0	632.0	536.0
Department of the Air Force	547.7	538.4	542.5	563.2	576.7	604.6	579.3	621.2	584.7	740.0	766.4
Defense agencies	716.6	737.7	735.0	751.3	791.5	1,038.1	964.6	944.7	1,162.9	1,408.8	1,245.4
Department of Education	68.7	77.3	91.3	103.8	106.6	117.5	125.3	123.1	119.5	122.4	131.5
Department of Energy	1,194.5	1,198.4	1,080.7	1,029.4	1,050.6	1,020.8	1,065.7	1,587.2	1,676.1	1,826.8	1,731.4
Department of Health & Human Services, total	1,651.5	1,795.8	1,850.8	2,194.0	2,415.6	2,700.4	2,818.1	3,112.4	2,886.8	3,257.0	3,417.9
Alcohol, Drug Abuse, & Mental Health Administration	165.2	179.7	191.5	241.1	286.6	384.7	415.0	463.9	NA	NA	NA
Centers for Disease Control	46.3	47.6	52.2	66.2	88.7	117.8	95.6	113.4	146.9	149.5	183.1
Food & Drug Administration	77.8	82.1	79.4	85.0	91.0	99.0	99.0	125.0	135.7	139.1	151.2
Health Care Financing Admin	33.1	33.5	29.0	27.3	28.2	49.1	49.1	69.1	75.5	68.7	68.6
Nat'l Institutes of Health [1]	1,285.6	1,410.1	1,469.0	1,739.1	1,885.6	2,008.5	2,074.1	2,193.5	2,341.3	2,716.4	2,800.9
Other	43.5	42.8	29.7	35.3	35.5	41.3	85.3	147.5	187.4	183.3	214.1
Department of Housing & Urban Development	6.3	6.5	5.3	5.5	6.3	6.1	6.6	9.4	8.8	9.4	12.8
Department of the Interior, total	254.3	231.0	234.9	247.3	266.0	253.0	269.8	324.1	339.7	343.8	331.6
Bureau of Mines	56.7	36.7	36.6	39.6	54.1	49.3	49.3	56.2	59.2	63.3	55.5
Geological Survey	125.1	130.0	127.8	131.7	135.8	126.8	134.2	159.3	164.3	165.2	173.7
US Fish & Wildlife Service	42.3	32.2	38.1	43.3	48.7	49.1	56.4	64.8	64.8	63.0	77.0
Other	30.2	32.1	32.4	32.7	27.4	27.8	29.9	43.8	51.4	52.3	25.4
Department of Justice, total	13.2	15.1	17.0	11.8	9.8	10.7	11.1	14.7	15.0	14.8	14.0
Department of Labor, total	11.2	9.1	8.7	19.0	26.4	21.8	21.3	24.0	23.6	19.9	20.5
Department of State, total	1.6	1.5	1.5	0.3	1.0	1.3	1.2	1.3	0.7	0.5	0.5

(continued)

Table B–24.

Federal obligations for applied research, by selected agency: fiscal years 1984–94

(page 2 of 2)

Selected agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	Estimates 1993	Estimates 1994
	Millions of dollars										
Department of Transportation, total	74.2	70.2	67.6	68.6	91.2	120.5	119.2	114.6	155.7	330.4	278.9
Federal Aviation Admin	15.0	17.3	14.0	11.1	13.3	23.6	26.1	24.0	30.1	68.7	75.1
Federal Highway Admin	6.1	6.3	14.7	20.7	43.7	56.6	57.6	46.1	72.0	186.1	147.4
National Highway Traffic Safety Administration	24.7	20.9	16.1	18.9	19.1	26.2	16.9	21.4	25.8	31.6	27.0
Other	28.4	25.7	22.8	17.9	15.1	14.1	18.6	23.1	27.8	44.0	29.4
Department of the Treasury, total	6.6	13.6	12.7	12.7	11.1	13.0	15.3	20.6	17.2	5.1	7.1
Department of Veterans Affairs	156.1	193.[illegible]	155.1	173.1	178.8	197.1	199.4	177.7	185.2	190.2	161.8
Agency for International Development	164.0	158.1	180.7	151.2	132.1	216.0	300.2	351.7	294.2	283.2	277.2
Environmental Protection Agency	142.3	176.0	179.3	246.1	240.7	222.6	241.6	261.9	293.9	327.4	396.9
National Aeronautics & Space Administration	954.7	1,032.7	1,152.3	1,255.5	1,218.9	1,461.4	1,423.8	1,665.6	1,491.1	1,606.0	2,104.7
National Science Foundation	70.5	83.8	78.1	99.3	99.6	107.8	103.3	109.0	126.9	151.2	169.5
Nuclear Regulatory Commission	190.7	150.0	123.8	122.5	108.5	114.8	108.8	108.8	119.0	119.7	122.1
All other agencies	32.0	28.4	29.6	31.8	35.0	31.3	36.8	34.4	45.6	46.6	48.5

[1] Fiscal year 1992 figures include obligations from the Alcohol, Drug Abuse, and Mental Health Administration. Due to reorganization within the Department of Health and Human Services, the Alcohol, Drug Abuse, and Mental Health Administration ceased to exist as of October 1992, and its research and development functions are reported with the National Institutes of Health data beginning with this volume.

NOTES: Because of rounding, detail may not add to totals.

KEY: NA = Not applicable (indicates that the agency or agency subdivision did not exist as such or in that organization in that year)

SOURCE: National Science Foundation/SRS, Survey of Federal Funds for Research and Development: Fiscal Years 1992, 1993, and 1994

Table B–25.

Federal obligations for development, by selected agency: fiscal years 1984–94

(page 1 of 2)

Selected agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	Estimates 1993	Estimates 1994
	Millions of dollars										
Total, all agencies	27,246.1	32,226.1	34,910.2	37,313.2	38,119.3	40,641.0	41,937.1	37,326.8	41,102.0	43,993.2	43,119.9
Department of Agriculture, total	31.3	32.0	32.1	29.0	31.4	36.1	47.1	61.2	66.1	66.8	68.1
Agricultural Research Svc	27.0	27.7	27.4	24.0	26.3	31.4	33.3	40.2	43.9	43.8	44.3
Other	4.3	4.3	4.7	5.0	5.1	4.7	13.8	21.0	22.2	23.0	23.8
Department of Commerce, total	61.5	74.6	59.7	63.7	46.6	46.9	61.2	39.9	55.3	103.0	153.6
National Institute of Standards & Technology	11.8	14.0	11.6	9.3	9.1	10.0	10.5	15.6	29.6	61.1	116.1
National Oceanic & Atmospheric Administration	46.6	45.4	37.2	51.7	34.8	34.1	47.7	22.4	23.7	39.8	35.4
Other	3.1	15.2	10.9	2.7	2.7	2.8	3.0	1.9	2.0	2.1	2.1
Department of Defense, total	22,324.3	26,623.2	29,710.7	31,884.0	32,009.7	33,920.8	33,738.9	28,416.9	32,056.1	34,111.1	33,107.0
Department of the Army	3,516.8	3,747.4	3,982.1	4,109.6	4,052.3	4,835.9	4,903.8	5,221.0	5,921.5	5,333.9	4,766.5
Department of the Navy	6,840.2	8,336.1	8,865.9	8,721.1	8,766.2	8,882.9	8,778.6	6,932.0	7,138.0	9,168.0	8,401.0
Department of the Air Force	11,351.5	12,524.3	12,834.8	14,562.9	14,094.2	14,430.0	14,055.1	10,107.1	12,636.6	12,910.5	12,981.9
Defense agencies	557.3	1,964.8	3,910.7	4,353.5	4,868.4	5,616.8	5,780.2	5,919.4	6,114.4	6,445.2	6,674.4
Operational Test & Evaluation, Director	NA	NA	0.0	8.4	68.2	14.4	32.6	13.6	12.4	12.0	12.6
Test & Evaluation, Deputy Under Secretary Defense	58.6	50.6	117.1	128.5	160.3	140.7	188.7	223.7	233.2	241.6	270.6
Department of Education	34.8	33.0	25.5	25.6	29.7	37.2	39.7	39.4	41.5	47.4	43.0
Department of Energy	2,648.7	2,825.0	2,648.0	2,659.4	2,801.0	2,760.9	3,060.1	2,709.5	2,759.7	2,983.9	3,068.7
Department of Health & Human Services, total	364.7	422.7	468.0	584.3	661.1	814.4	938.5	1,593.5	1,042.3	1,203.2	1,238.2
Nat'l Institutes of Health[1]	347.0	399.6	417.5	536.2	610.2	716.5	800.7	912.5	1,010.5	1,172.5	1,209.0
Other	17.7	23.1	50.5	48.1	50.9	97.9	137.8	681.0	31.8	30.7	29.2
Department of Housing & Urban Development	11.9	12.0	10.1	10.8	12.1	11.9	12.7	18.4	16.3	17.0	22.7
Department of the Interior, total	30.7	22.4	17.3	21.7	24.3	27.1	33.3	39.5	38.6	39.0	43.5
Department of Justice, total	6.6	16.7	14.1	22.5	25.7	20.6	20.6	27.8	27.7	27.5	28.4
Department of Labor, total	0.0	0.9	0.9	1.2	8.9	13.3	51.4	19.7	27.9	45.2	44.9
Department of Transportation, total	370.6	357.6	317.3	256.2	213.4	182.9	247.4	265.3	288.1	413.5	406.5
Federal Aviation Admin	251.2	269.0	246.6	156.2	147.3	123.2	189.9	196.2	206.1	201.5	197.0
Federal Highway Admin	40.3	42.6	30.8	56.0	30.4	34.4	33.8	40.8	57.0	145.1	114.0
Other	79.1	46.0	39.9	44.0	35.7	25.3	23.7	28.3	25.0	66.9	95.5
Department of the Treasury, total	3.3	6.0	6.3	9.5	10.2	9.3	6.9	6.7	3.8	5.6	6.3

(continued)

Table B–25.

Federal obligations for development, by selected agency: fiscal years 1984–94

(page 2 of 2)

Selected agency	1984	1985	1986	1987	1988	1989	1990	1991	1992	Estimates 1993	1994
	Millions of dollars										
Department of Veterans Affairs	18.4	17.5	16.3	19.2	19.2	21.0	22.1	22.8	23.0	38.3	32.3
Agency for International Development	70.3	60.5	66.2	63.5	69.3	60.0	29.3	20.4	65.9	91.2	138.8
Environmental Protection Agency	89.2	105.8	99.5	71.0	79.5	107.0	104.5	79.5	79.6	78.9	79.0
National Aeronautics & Space Administration	1,112.7	1,543.6	1,350.8	1,517.8	1,998.8	2,514.7	3,472.6	3,909.1	4,428.3	4,631.9	4,540.9
Tennessee Valley Authority	53.8	65.1	59.8	60.2	68.8	48.0	43.2	49.5	72.9	81.1	89.7
All other agencies	13.3	7.5	7.6	13.6	9.6	8.9	7.6	7.7	8.9	8.6	8.3

[1] Fiscal year 1992 figures include obligations from the Alcohol, Drug Abuse, and Mental Health Administration. Due to reorganization within the Department of Health and Human Services, the Alcohol, Drug Abuse, and Mental Health Administration ceased to exist as of October 1992, and its research and development functions are reported with the National Institutes of Health data beginning with this volume.

NOTES: Because of rounding, detail may not add to totals

KEY: NA = Not applicable (indicates that the agency or agency subdivision did not exist as such or in that organization in that year

SOURCE: National Science Foundation/SRS, Survey of Federal Funds for Research and Development: Fiscal Years 1992, 1993, and 1994

Table B–26.

Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1982–92

(page 1 of 2)

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
		Millions of dollars										
Total.		58,650	65,268	74,800	84,239	87,823	92,155	97,015	102,055	109,727	116,952	121,314
		Distribution by industry										
Food, kindred, and tobacco products [1]	20,21	(D)	(D)	(D)	(D)	(D)	1,206	(D)	(D)	(D)	1,277	1,411
Textiles and apparel	22,23	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	277
Lumber, wood products, and furniture	24,25	159	152	143	147	144	137	(D)	(D)	(D)	(D)	(D)
Paper and allied products	26	566	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Chemicals and allied products	28	6,604	7,185	7,927	8,540	8,843	9,635	11,067	12,069	13,291	14,648	16,711
Industrial chemicals	281-82,286	3,206	3,214	3,240	3,498	3,552	3,716	4,172	4,451	5,010	5,390	5,406
Drugs and medicines	283	(D)	(D)	(D)	(D)	3,658	(D)	(D)	(D)	(D)	(D)	8,831
Other chemicals	284-85,287-89	(D)	(D)	(D)	(D)	1,633	(D)	(D)	(D)	(D)	(D)	2,474
Petroleum refining and extraction	13,29	(D)	(D)	(D)	(D)	(D)	1,897	1,997	2,180	2,306	2,498	2,339
Rubber products	30	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Stone, clay, and glass products	32	(D)	(D)	(D)	(D)	950	995	(D)	(D)	(D)	(D)	(D)
Primary metals	33	987	1,085	(D)	(D)	(D)	730	637	686	739	714	555
Ferrous metals and products	331-32,3398-99	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Nonferrous metals and products	333-36	(D)	(D)	336	416	458	(D)	(D)	(D)	(D)	(D)	(D)
Fabricated metal products	34	625	701	842	829	895	783	881	904	939	974	1,057
Machinery	35	8,078	9,027	10,504	12,216	(D)	(D)	(D)	(D)	14,446	14,775	15,135
Office, computing, and accounting machines	357	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other machinery, except electrical	351-56,358-59	(D)	(D)	(D)	(D)	2,396	2,428	(D)	(D)	(D)	(D)	(D)
Electrical equipment	36	10,923	12,681	13,778	14,432	14,980	15,848	14,128	13,318	13,400	13,415	13,546
Radio and TV receiving equipment	365	(D)	(D)	(D)	(D)	133	139	(D)	(D)	(D)	(D)	(D)
Communication equipment	366	5,839	7,298	8,685	9,397	9,669	10,184	8,427	7,071	5,928	4,787	(D)
Electronic components	367	1,740	2,169	2,831	3,385	(D)	4,286	(D)	(D)	(D)	(D)	3,678
Other electrical equipment	361-64,369	(D)	(D)	(D)	(D)	(D)	1,239	(D)	(D)	(D)	(D)	(D)
Transportation equipment	37	(D)	(D)	(D)	(D)	31,275	34,246	34,775	33,859	31,361	27,428	26,484
Motor vehicles and motor vehicles equipment	371	4,797	5,318	6,057	6,984	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment	373-75,379	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles	372,376	14,451	15,406	18,858	22,231	21,050	24,458	24,168	22,331	20,635	16,629	16,119
Professional and scientific instruments	38	3,930	4,266	4,602	5,013	5,103	5,222	5,530	5,992	7,055	8,705	9,652
Scientific and mechanical measuring instruments	381-82	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	5,256
Optical, surgical, photographic, and other instruments	384-87	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	4,396
Other manufacturing industries [1]	27,31,39	(D)	(D)	(D)	(D)	382	(D)	(D)	(D)	(D)	(D)	(D)

(continued)

Table B–26.

Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1982–92

(page 2 of 2)

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
		Millions of dollars										
Nonmanufacturing industries	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-85, 87, 89	2,472	3,337	4,905	6,714	7,446	7,844	10,513	14,031	20,793	28,446	30,103
		Distribution by size of company [Based on number of employees]										
Total		58,650	65,268	74,800	84,239	87,623	92,155	97,015	102,055	109,727	116,952	121,314
Fewer than 500[2]		2,934	4,422	4,402	5,866	7,071	7,163	(S)	7,809	(S)	13,172	14,496
500 to 999[3]		N/A	N/A	1,439	1,648	1,902	1,725	1,669	1,825	2,154	8,000	8,410
1,000 to 4,999		3,864	4,178	5,520	6,240	7,472	7,262	7,622	7,881	8,411	10,453	12,415
5,000 to 9,999		2,751	2,798	3,251	4,022	4,251	4,501	5,245	5,756	6,746	8,049	8,672
10,000 to 24,999		7,943	9,499	11,351	11,109	10,493	12,043	11,506	10,450	12,486	15,770	16,419
25,000 or more		41,156	44,372	48,837	55,354	56,991	59,461	63,694	68,334	71,030	61,508	60,902

[1] Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

[2] Data for 1982-83 are for companies with fewer than 1,000 employees.

[3] Until 1984, data were not broken down into this level of detail. See "Fewer than 500," above.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.
N/A = Not available

NOTE: As a result of a new sample design, statistics for 1988-92 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See Appendix A for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table B–27.

Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1982–92
(page 1 of 2)

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
		Millions of dollars										
Total		40,105	44,588	51,404	57,043	59,932	61,403	66,672	73,501	81,602	90,580	96,654
		Distribution by industry										
Food, kindred, and tobacco products [1]	20,21	777	824	1,081	1,136	1,280	1,204	1,173	1,244	1,248	1,277	1,411
Textiles and apparel	22,23	136	150	182	218	246	243	215	(S)	260	236	259
Lumber, wood products, and furniture	24,25	159	152	143	147	144	137	165	192	216	200	(D)
Paper and allied products	26	566	552	594	576	538	604	752	879	1,059	1,174	1,191
Chemicals and allied products	28	6,197	6,792	7,736	8,310	8,664	9,445	10,828	11,943	13,168	14,439	16,420
Industrial chemicals	281-82,286	2,810	2,828	3,057	3,281	3,374	3,531	3,939	4,340	4,902	5,225	5,152
Drugs and medicines	283	2,473	2,896	3,310	3,481	3,657	4,095	4,900	5,512	5,917	6,947	8,822
Other chemicals	284-85,267-89	914	1,068	1,369	1,548	1,633	1,819	1,989	2,091	2,349	2,267	2,447
Petroleum refining and extraction	13,29	2,003	2,074	2,245	2,194	1,971	1,883	1,975	2,162	2,289	2,487	2,330
Rubber products	30	617	638	671	659	655	596	(D)	(D)	(D)	(D)	1,337
Stone, clay, and glass products	32	472	586	705	825	941	985	697	615	538	455	479
Primary metals	33	711	701	683	730	786	711	620	666	717	706	542
Ferrous metals and products	331-32,3398-99	426	396	357	323	336	249	252	244	231	225	224
Nonferrous metals and product	333-36	285	305	326	407	450	462	368	422	486	481	318
Fabricated metal products	34	565	634	773	780	800	633	718	726	736	748	764
Machinery	35	7,227	7,911	9,312	10,721	10,701	10,577	11,929	13,342	13,575	13,720	14,073
Office, computing, and accounting machines	357	4,944	5,634	7,011	8,418	8,380	8,193	9,347	10,725	10,988	10,419	10,650
Other machinery, except electrical	351-56,358-59	2,283	2,277	2,301	2,303	2,321	2,384	2,582	2,618	2,587	3,301	3,423
Electrical equipment	36	6,682	8,158	9,037	9,271	9,767	10,449	9,975	9,575	9,267	8,865	9,689
Radio and TV receiving equipment	365	364	324	362	350	133	139	(D)	(D)	(D)	(D)	93
Communication equipment	366	3,555	4,500	5,147	5,174	5,117	5,455	4,798	4,159	3,584	(S)	3,435
Electronic components	367	1,342	1,810	2,354	2,826	3,357	3,630	3,684	3,655	3,496	3,177	3,428
Other electrical equipment	361-64,369	1,421	1,524	1,174	921	1,160	1,225	(D)	(D)	(D)	(D)	2,733
Transportation equipment	37	8,621	8,991	10,406	12,092	13,567	13,462	13,910	14,596	14,264	14,858	15,726
Motor vehicles and motor vehicles equipment	371	4,321	4,754	5,384	6,164	7,171	7,167	7,783	8,756	8,594	9,063	(D)
Other transportation equipment	373-75,379	114	227	258	279	330	356	361	337	283	262	(D)
Aircraft and missiles	372,376	4,186	4,010	4,764	5,649	6,066	5,939	5,766	5,503	5,387	5,533	6,248
Professional and scientific instruments	38	3,407	3,816	4,211	4,622	4,752	4,950	5,339	5,729	6,318	6,840	7,426
Scientific and mechanical measuring instruments	381-82	1,363	1,605	1,671	1,596	1,521	1,598	1,863	2,205	2,696	3,017	3,108
Optical, surgical, photographic, and other instruments	384-87	2,044	2,211	2,540	3,026	3,231	3,352	3,476	3,524	3,621	3,823	4,318

(continued)

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Table B–27.

Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1982–92

(page 2 of 2)

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
		Millions of dollars										
Other manufacturing industries[1]	27,31,39	493	525	373	361	380	380	(D)	(D)	(D)	(D)	(D)
Nonmanufacturing industries	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-85, 87, 89	1,472	2,084	3,252	4,401	4,740	5,144	7,257	10,302	16,351	22,941	24,211
		Distribution by size of company [Based on number of employees]										
Total		40,105	44,588	51,404	57,043	59,932	61,403	66,672	73,501	81,602	90,580	96,654
Fewer than 500[2]		2,411	3,781	3,781	5,127	6,203	6,200	(S)	(S)	(S)	11,285	12,381
500 to 999[3]		N/A	N/A	1,341	1,531	1,765	1,610	1,748	1,934	2,144	7,819	8,232
1,000 to 4,999		3,241	3,438	4,618	5,249	6,243	6,281	6,820	7,546	8,363	9,403	11,259
5,000 to 9,999		2,224	2,080	2,764	3,350	3,455	3,753	4,075	4,509	4,997	7,233	7,821
10,000 to 24,999		6,448	7,228	8,546	8,366	8,489	9,681	10,512	11,631	12,890	12,397	12,960
25,000 or more		25,781	28,061	30,354	33,421	33,778	33,878	36,785	40,703	45,106	42,443	44,001

[1] Until 1984, tobacco products (SIC 21) was included with Other manufacturing industries.

[2] Data for 1982-83 are for companies with fewer than 1,000 employees.

[3] Until 1984, data were not broken down into this level of detail. See Fewer than 500, above.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.
N/A = Not available

NOTES: As a result of a new sample design, statistics for 1988-92 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See Appendix A for more information. Company funds include all funds for industrial R&D work performed within company facilities from all sources except the Federal Government. The funds may be the companies' own or from outside organizations such as research institutions, universities and colleges, nonprofit organizations, other companies, and state governments. Company-financed R&D not performed within the company is excluded.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table B–28.

Federal funds for industrial R&D performance, by industry and size of company: 1982–92

(page 1 of 2)

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
		Millions of dollars										
Total		18,545	20,680	23,396	27,196	27,891	30,752	30,343	28,554	28,125	26,372	24,660
		Distribution by industry										
Food, kindred, and tobacco products [1]	20,21	(D)	(D)	(D)	(D)	(D)	2	(D)	(D)	(D)	0	0
Textiles and apparel	22,23	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(S)	(S)
Lumber, wood products, and furniture	24,25	0	0	0	0	0	0	(D)	(D)	(D)	(D)	(D)
Paper and allied products	26	0	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Chemicals and allied products	28	407	393	191	230	179	190	238	126	123	209	(S)
Industrial chemicals	281-82,286	396	386	183	217	178	185	232	111	109	165	(S)
Drugs and medicines	283	(D)	(D)	(D)	(D)	1	(D)	(D)	(D)	(D)	(D)	(S)
Other chemicals	284-85,287-89	(D)	(D)	(D)	(D)	0	(D)	(D)	(D)	(D)	(D)	(S)
Petroleum refining and extraction	13,29	(D)	(D)	(D)	(D)	(D)	14	22	(S)	(S)	11	9
Rubber products	30	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Stone, clay, and glass products	32	(D)	(D)	(D)	(D)	9	10	(D)	(D)	(D)	(D)	(D)
Primary metals	33	276	384	(D)	(D)	(D)	19	17	22	(D)	8	(S)
Ferrous metals and products	331-32,3398-99	(D)	(D)	(D)	(D)	(D)	(D)	1	(D)	(D)	1	(D)
Nonferrous metals and products	333-36	(D)	(D)	10	9	8	(D)	16	(D)	(D)	7	(D)
Fabricated metal products	34	60	67	69	49	95	150	163	178	203	226	293
Machinery	35	851	1,116	1,192	1,495	(D)	(D)	(D)	(D)	871	1,055	1,062
Office, computing, and accounting machines	357	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other machinery, except electrical	351-56,358-59	(D)	(D)	(D)	(D)	75	44	(D)	(D)	(D)	(D)	(D)
Electrical equipment	36	4,241	4,523	4,741	5,161	5,213	5,399	4,153	3,743	4,133	4,550	3,857
Radio and TV receiving equipment	365	(D)	(D)	(D)	(D)	0	0	0	0	0	0	(D)
Communication equipment	366	2,284	2,798	3,538	4,223	4,552	4,729	(D)	(D)	(D)	(D)	(D)
Electronic components	367	398	359	477	559	(D)	656	(D)	(D)	(D)	(D)	250
Other electrical equipment	361-64,369	(D)	(D)	(D)	(D)	(D)	14	(D)	(D)	(D)	(D)	(D)
Transportation equipment	37	(D)	(D)	(D)	(D)	17,708	20,784	20,865	19,262	17,097	12,570	10,738
Motor vehicles and motor vehicles equipment	371	476	564	673	820	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment	373-75,379	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles	372,376	10,265	11,396	14,094	16,582	14,984	18,519	18,402	16,828	15,248	11,096	9,872
Professional and scientific instruments	38	523	450	391	391	351	272	191	263	737	1,865	2,226
Scientific and mechanical measuring instruments	381-82	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	2,147
Optical, surgical, photographic, and other instruments	384-87	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	79
Other manufacturing industries [1]	27,31,39	(D)	(D)	(D)	(D)	2	(D)	(D)	(D)	(D)	(D)	(D)

(continued)

Table B–28.

Federal funds for industrial R&D performance, by industry and size of company: 1982–92

(page 2 of 2)

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
		Millions of dollars										
Nonmanufacturing industries	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-85, 87, 89	1,000	1,253	1,653	2,313	2,706	2,700	3,256	3,729	4,442	5,505	5,892
		Distribution by size of company [Based on number of employees]										
Total		18,545	20,680	23,396	27,196	27,891	30,752	30,343	28,554	28,125	26,372	24,660
Fewer than 500[2]		523	641	621	739	868	963	816	901	895	1,887	2,115
500 to 999[3]		N/A	N/A	98	117	137	115	131	97	(S)	181	178
1,000 to 4,999		623	740	902	991	1,229	981	1,093	958	881	1,050	1,156
5,000 to 9,999		527	718	487	672	796	748	864	740	257	816	851
10,000 to 24,999		1,495	2,271	2,805	2,743	2,004	2,362	1,705	1,129	1,526	3,373	3,459
25,000 or more		15,377	16,311	18,483	21,933	23,213	25,583	25,734	24,709	24,436	19,065	16,901

[1] Until 1984, tobacco products (SIC 21) was included with Other manufacturing industries.

[2] Data for 1982-83 are for companies with fewer than 1,000 employees.

[3] Until 1984, data were not broken down into this level of detail. See Fewer than 500, above.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.
N/A = Not available

NOTE: As a result of a new sample design, statistics for 1988-92 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See Appendix A for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table B–29.

Total (company, Federal, and other) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1982–92

(page 1 of 2)

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
		Percent										
Total		3.8	3.9	3.9	4.4	4.7	4.6	4.5	4.3	4.2	4.2	4.2
		Distribution by industry										
Food, kindred, and tobacco products[1]	20,21	(D)	(D)	(D)	(D)	(D)	0.6	(D)	(D)	(D)	0.5	0.5
Textiles and apparel	22,23	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Lumber, wood products, and furniture	24,25	0.8	0.8	0.7	0.8	0.6	0.6	(D)	(D)	(D)	(D)	(D)
Paper and allied products	26	1.1	(D)	(D)	(D)	(D)	(D)	(D)	0.8	1.0	1.1	1.1
Chemicals and allied products	28	4.3	4.4	4.7	5.0	5.2	5.3	5.3	5.4	5.3	5.4	6.0
Industrial chemicals	281–82,286	4.0	3.9	4.0	4.4	4.6	4.7	4.4	4.2	4.5	4.6	4.6
Drugs and medicines	283	(D)	(D)	(D)	(D)	8.5	(D)	8.8	(D)	(D)	8.9	10.7
Other chemicals	284–85,287–89	(D)	(D)	(D)	(D)	3.3	(D)	3.4	(D)	(D)	3.1	3.1
Petroleum refining and extraction	13,29	(D)	(D)	(D)	(D)	(D)	1.0	1.0	0.9	0.9	1.0	1.0
Rubber products	30	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Stone, clay, and glass products	32	(D)	(D)	(D)	(D)	2.5	2.6	(D)	(D)	(D)	(D)	(D)
Primary metals	33	1.1	1.3	(D)	(D)	(D)	0.9	0.8	0.8	0.8	0.8	0.6
Ferrous metals and products	331–32,3398–99	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Nonferrous metals and products	333–36	(D)	(D)	1.2	1.4	1.5	(D)	(D)	(D)	(D)	(D)	(D)
Fabricated metal products	34	1.3	1.4	1.5	1.5	1.5	1.5	1.3	1.5	1.4	1.5	1.6
Machinery	35	5.6	6.2	6.4	7.6	(D)	(D)	7.7	7.9	7.7	8.1	7.8
Office, computing, and accounting machines	357	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other machinery, except electrical	351–56,358–59	(D)	(D)	(D)	(D)	3.0	3.0	(D)	(D)	(D)	(D)	(D)
Electrical equipment	36	7.2	7.9	6.8	7.6	7.9	8.2	7.5	7.3	6.5	6.5	5.7
Radio and TV receiving equipment	365	(D)	(D)	(D)	(D)	3.6	3.2	(D)	(D)	(D)	(D)	(D)
Communication equipment	366	11.0	11.5	9.8	10.1	9.9	10.2	(D)	(D)	(D)	(D)	(D)
Electronic components	367	6.8	7.7	7.8	9.6	(D)	10.0	9.0	(D)	8.3	7.9	7.7
Other electrical equipment	361–64.369	(D)	(D)	(D)	(D)	(D)	2.7	(D)	(D)	(D)	(D)	(D)
Transportation equipment	37	N/A	N/A	(D)	(D)	8.3	8.7	8.9	8.1	7.5	7.3	7.0
Motor vehicles and motor vehicles equipment	371	4.5	4.0	3.4	3.8	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment	373-75,379	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles	372,376	17.1	15.2	15.4	14.9	13.4	14.7	16.3	13.5	11.8	12.1	11.8

(continued)

Table B–29.

Total (company, Federal, and other) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1982–92

(page 2 of 2)

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
		Percent										
Professional and scientific instruments	38	8.4	8.6	8.3	8.9	8.8	7.9	7.4	7.2	8.0	9.1	8.9
Scientific and mechanical measuring instruments	381-82	(D)	(D)	(D)	(D)	(D)	(D)	7.9	7.4	8.6	10.0	10.5
Optical, surgical, photographic, and other instruments	384-87	(D)	(D)	(D)	(D)	(D)	(D)	7.3	7.3	7.7	8.1	8.4
Other manufacturing industries[1]	27,31,39	(D)	(D)	(D)	(D)	1.2	(D)	(D)	(D)	(D)	(D)	(D)
		Distribution by size of company [Based on number of employees]										
Fewer than 500[2]		1.8	2.5	2.9	3.6	4.1	3.9	3.7	3.6	3.4	3.3	3.2
500 to 999[3]		N/A	N/A	2.3	2.4	2.4	2.3	1.8	1.8	1.9	2.5	2.9
1,000 to 4,999		1.9	2.0	2.2	2.6	2.5	2.6	2.4	2.2	2.0	2.5	2.9
5,000 to 9,999		1.7	1.7	1.8	1.9	2.3	2.3	2.3	2.6	2.9	3.0	2.9
10,000 to 24,999		2.4	2.8	3.1	3.1	3.2	3.1	3.1	2.8	2.7	3.6	3.5
25,000 or more		5.4	5.5	5.3	6.2	6.5	6.6	6.3	5.8	5.6	5.6	5.5

[1] Until 1984, tobacco products (SIC 21) was included with Other manufacturing industries.

[2] Data for 1982–83 are for companies with fewer than 1,000 employees.

[3] Until 1984, data were not broken down into this level of detail. See Fewer than 500, above.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
N/A = Not available

NOTE: As a result of a new sample design, statistics for 1988-92 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See Appendix A for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table B–30.
Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1982–92
(page 1 of 2)

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
		Percent										
Total		2.6	2.6	2.6	3.0	3.2	3.1	3.1	3.1	3.1	3.2	3.3
		Distribution by industry										
Food, kindred, and tobacco products[1]	20,21	0.4	0.4	0.4	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5
Textiles and apparel	22,23	0.5	0.4	0.5	0.5	0.5	0.4	0.4	0.5	0.6	0.6	0.6
Lumber, wood products, and furniture	24,25	0.8	0.8	0.7	0.8	0.6	0.6	0.6	0.6	0.6	0.9	0.9
Paper and allied products	26	1.1	0.9	0.8	0.8	0.7	0.6	0.8	0.8	1.0	1.1	1.0
Chemicals and allied products	28	4.0	4.2	4.6	4.9	5.1	5.2	5.2	5.4	5.3	5.3	5.9
Industrial chemicals	281-82,286	3.5	3.4	3.8	4.2	4.4	4.4	4.2	4.1	4.4	4.4	4.4
Drugs and medicines	283	7.0	7.7	8.2	8.0	8.4	8.7	8.8	8.9	8.8	8.9	10.7
Other chemicals	284-85,287-89	2.3	2.5	2.9	3.1	3.3	3.3	3.4	3.9	3.4	3.0	3.1
Petroleum refining and extraction	13,29	0.8	0.7	0.7	0.9	1.1	1.0	1.0	0.9	0.9	1.0	1.0
Rubber products	30	1.7	1.7	1.9	1.8	1.7	1.6	1.7	1.9	2.1	2.3	2.5
Stone, clay, and glass products	32	1.7	1.9	1.9	2.3	2.4	2.5	2.0	1.8	1.7	1.6	1.7
Primary metals	33	0.8	0.8	0.9	0.9	1.0	0.9	0.7	0.7	0.8	0.8	0.6
Ferrous metals and products	331-32,3398-99	0.6	0.6	0.6	0.5	0.7	0.6	0.5	0.5	0.5	0.5	0.5
Nonferrous metals and products	333-36	1.3	1.2	1.2	1.4	1.5	1.3	1.0	1.0	1.2	1.2	0.8
Fabricated metal products	34	1.2	1.3	1.4	1.4	1.4	1.2	1.1	1.2	1.1	1.2	1.1
Machinery	35	5.0	5.4	5.8	6.7	7.3	7.1	6.8	7.3	7.2	7.5	7.3
Office, computing, and accounting machines	357	10.4	10.0	10.5	12.4	12.4	12.3	11.2	13.1	14.4	14.9	13.8
Other machinery, except electrical	351-56,358-59	2.4	2.4	2.5	2.6	2.9	3.0	2.8	2.6	2.3	2.9	2.9
Electrical equipment	36	4.4	5.0	4.5	4.8	5.1	5.4	5.3	5.2	4.5	4.3	4.1
Radio and TV receiving equipment	365	3.3	2.9	3.7	4.3	3.6	3.2	2.4	1.8	1.6	1.0	0.7
Communication equipment	366	6.7	7.2	5.1	5.4	5.2	5.5	6.1	6.8	6.1	(S)	7.1
Electronic components	367	5.2	6.6	6.6	8.2	9.2	8.5	8.0	7.7	7.4	7.2	7.2
Other electrical equipment	361-64,369	2.3	2.6	2.2	2.0	2.2	2.6	2.3	2.3	2.2	2.2	2.2
Transportation equipment	37	N/A	N/A	3.3	3.4	3.6	3.4	3.5	3.5	3.4	4.0	4.1
Motor vehicles and motor vehicles equipment	371	4.0	3.5	3.0	3.1	3.3	3.4	3.4	3.7	3.7	4.1	4.0
Other transportation equipment	373-75,379	0.7	1.7	2.0	2.3	2.7	2.5	2.6	2.5	2.1	2.1	(S)
Aircraft and missiles	372,376	5.1	4.1	4.0	3.9	4.0	3.6	3.9	3.3	3.1	4.0	4.6

(continued)

Table B–30.

Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1982–92

(page 2 of 2)

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
		Percent										
Professional and scientific instruments	38	7.3	7.7	7.6	8.3	8.2	7.5	7.1	6.8	7.1	7.1	7.2
Scientific and mechanical measuring instruments	381-82	7.6	8.8	8.3	8.4	8.4	8.1	7.6	6.9	6.9	6.3	6.2
Optical, surgical, photographic, and other instruments	384-87	7.1	7.1	7.3	8.1	8.0	7.2	7.1	7.1	7.5	8.0	8.2
Other manufacturing industries[1]	27,31,39	0.8	1.0	1.1	1.0	1.2	1.1	1.0	0.9	0.9	0.8	1.0
		Distribution by size of company [Based on number of employees]										
Fewer than 500[2]		1.6	2.2	2.8	3.4	4.0	3.8	3.7	3.5	3.3	3.2	3.0
500 to 999[3]		N/A	N/A	2.2	2.2	2.2	2.2	1.7	1.7	1.7	2.4	2.8
1,000 to 4,999		1.7	2.0	2.0	2.4	2.4	2.4	2.3	2.1	1.9	2.4	2.8
5,000 to 9,999		1.5	1.3	1.6	1.8	2.0	2.0	2.0	2.1	2.8	2.9	2.8
10,000 to 24,999		2.0	2.3	2.5	2.5	2.6	2.5	2.6	2.5	2.5	3.0	2.9
25,000 or more		3.3	3.4	3.2	3.5	3.7	3.8	3.7	3.7	3.6	3.8	3.9

[1] Until 1984, tobacco products (SIC 21) was included with Other manufacturing industries.

[2] Data for 1982-83 are for companies with fewer than 1,000 employees.

[3] Until 1984, data were not broken down into this level of detail. See Fewer than 500, above.

KEY: (S) = Data have been withheld because of imputation of more than 50 percent.
N/A = Not available

NOTE: As a result of a new sample design, statistics for 1988-92 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See Appendix A for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table B–31.

Funds for basic research, applied research, and development by industry, by source of funds: 1992

(page 1 of 2)

Distribution by industry	SIC code	Total			Basic			Applied			Development		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		Millions of dollars											
Total		121,314	24,660	96,654	9,794	2,792	7,002	27,174	4,951	22,224	84,345	16,917	67,428
Food, kindred, and tobacco products	20,21	1,411	0	1,411	122	0	122	488	0	488	801	0	801
Textiles and apparel	22,23	277	(S)	259	(D)	(D)	33	(D)	(D)	38	198	10	188
Lumber, wood products, and furniture	24,25	(D)	(D)	(D)	(D)	(D)	(D)	70	0	70	(D)	(D)	(D)
Paper and allied products	26	(D)	(D)	1,191	(D)	0	(D)	(D)	(D)	536	(D)	0	(D)
Chemicals and allied products	28	16,711	(S)	16,420	2,054	16	2,038	5,583	77	5,506	9,073	196	8,877
Industrial chemicals	281-82,286	5,406	(S)	5,152	(D)	(D)	635	(D)	(D)	1,306	3,390	178	3,212
Drugs and medicines	283	8,831	(S)	8,822	1,235	3	1,232	(D)	(D)	3,342	(D)	(D)	4,248
Other chemicals	284-85,287-89	2,474	(S)	2,447	(D)	(D)	171	(D)	(D)	858	(D)	(D)	1,418
Petroleum refining and extraction	13,29	2,339	9	2,330	(D)	(D)	238	1,052	0	1,052	(D)	(D)	1,039
Rubber products	30	(D)	(D)	1,337	(S)	0	193	249	0	249	(D)	(D)	894
Stone, clay, and glass products	32	(D)	(D)	479	(D)	(D)	42	(D)	(D)	176	(D)	(D)	261
Primary metals	33	555	(S)	542	(D)	(D)	33	(D)	(D)	237	274	2	272
Ferrous metals and products	331-32,3398-99	(D)	(D)	224	(D)	(D)	10	105	0	105	(D)	(D)	109
Nonferrous metals and products	333-36	(D)	(D)	318	24	0	24	142	(S)	132	(D)	(D)	162
Fabricated metal products	34	1,057	293	764	(D)	(D)	57	(D)	(D)	158	838	289	549
Machinery	35	15,135	1,062	14,073	(D)	(D)	744	(D)	(D)	1,782	12,152	606	11,547
Office, computing, and accounting machines	357	(D)	(D)	10,650	(D)	(D)	579	(D)	(D)	950	(D)	(D)	9,121
Other machinery, except electrical	351-56,358-59	(D)	(D)	3,423	(D)	(D)	165	857	25	832	(D)	(D)	2,426
Electrical equipment	36	13,546	3,857	9,689	(D)	(D)	350	(D)	(D)	2,672	9,232	2,565	6,667
Radio and TV receiving equipment.	365	(D)	(D)	93	(D)	0	(D)	(D)	(D)	(D)	(D)	(D)	75
Communication equipment	366	(D)	(D)	3,435	(D)	(D)	76	(D)	(D)	731	(D)	(D)	2,628
Electronic components	367	3,678	250	3,428	(D)	(D)	(D)	(D)	(D)	(D)	2,647	184	2,463
Other electrical equipment	361-64,369	(D)	(D)	2,733	(D)	(D)	141	(D)	(D)	1,091	3,240	1,739	1,501

(continued)

Table B–31.
Funds for basic research, applied research, and development by industry, by source of funds: 1992
(page 2 of 2)

Distribution by industry	SIC code	Total			Basic			Applied			Development		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		Millions of dollars											
Transportation equipment	37	26,484	10,758	15,726	595	422	173	2,489	1,084	1,406	23,397	9,250	14,146
Motor vehicles and motor vehicles equipment	371	(D)	(D)	(D)	94	0	94	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment	373–75,379	(D)	(D)	(D)	21	0	21	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles	372,376	16,119	9,871	6,248	480	422	58	1,775	1,040	735	13,863	8,409	5,455
Professional and scientific instruments	38	$9,652	$2,226	$7,426	524	9	515	2,645	453	2,193	6,483	1,764	4,718
Scientific and mechanical measuring instruments	381–82	5,256	2,148	3,108	(D)	(D)	170	(D)	(D)	1,251	(D)	(D)	1,687
Optical, surgical, photographic, and other instruments	383–87	4,396	78	4,318	(D)	(D)	345	(D)	(D)	942	(D)	(D)	3,031
Other manufacturing industries	27,31,39	(D)	(D)	(D)	(D)	(D)	(D)	155	60	95	(D)	(D)	407
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–85, 87, 89	30,103	5,892	24,211	4,489	2,304	2,185	7,044	1,479	5,565	18,570	2,109	16,460

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

SOURCE: National Science Foundation/SRS, Research and Development in Industry: 1992

Table B–32.

Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry and size of company: 1983–93

(page 1 of 2)

Industry and size of company	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
		Thousands										
Total (January)		540.9	584.1	622.5	671.0	695.8	708.6	722.5	743.6	773.4	779.3	787.1
Total (Annual average)		562.5	603.3	646.8	683.4	702.2	715.6	733.0	758.5	776.4	783.8	N/A
		Distribution by industry										
Food, kindred, and tobacco products[1]	20,21	7.7	7.4	(S)	(S)	(S)	(S)	(S)	(S)	9.4	9.8	9.9
Textiles and apparel	22,23	2.2	2.3	2.8	2.6	2.4	2.4	2.5	2.8	(S)	2.8	3.1
Lumber, wood products, and furniture	24,25	1.8	(T)	(S)	(S)	1.3	1.3	1.4	(S)	(S)	1.5	1.7
Paper and allied products	26	7.6	6.6	6.6	6.4	6.0	6.1	6.4	8.5	(S)	10.7	10.7
Chemicals and allied products	28	67.3	69.8	71.1	75.8	75.2	75.8	78.3	80.4	81.6	85.6	89.2
Industrial chemicals	281-82,286	26.6	25.6	23.5	24.9	(S)	(S)	(S)	(S)	(S)	29.9	29.6
Drugs and medicines	283	28.2	(T)	30.8	31.8	32.6	33.0	34.4	34.3	35.4	38.7	42.6
Other chemicals	284-85,287-89	12.1	13.4	16.7	19.1	20.2	20.3	18.8	18.9	17.0	17.0	17.0
Petroleum refining and extraction	13,29	14.7	13.3	13.5	10.4	9.9	9.5	10.7	11.1	11.4	11.5	11.5
Rubber products	30	(T)	(T)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	14.8	14.9
Stone, clay, and glass products	32	5.5	5.6	6.6	7.5	8.6	8.6	7.6	7.0	6.0	5.3	5.3
Primary metals	33	8.3	8.4	7.1	5.7	5.5	5.6	5.5	5.2	4.6	5.1	4.9
Ferrous metals and products	331-32,3398-99	5.2	5.3	4.2	2.5	(S)	2.3	2.3	(S)	(S)	1.7	1.6
Nonferrous metals and products	333-36	3.0	3.1	2.9	3.2	3.4	3.3	3.3	3.3	3.0	(S)	(S)
Fabricated metal products	34	(T)	16.6	(S)	(S)	9.9	10.5	9.9	10.1	(S)	8.7	8.2
Machinery	35	79.6	87.0	81.7	89.7	95.8	98.4	100.4	113.3	109.7	99.3	99.4
Office, computing, and accounting machines	357	52.6	56.5	61.8	71.9	73.4	74.4	75.0	84.7	77.6	67.1	66.6
Other machinery, except electrical	351-56,358-59	27.0	30.5	19.9	17.8	22.4	24.0	25.4	28.6	32.1	32.2	32.8
Electrical equipment	36	108.6	113.2	113.2	117.9	130.4	132.5	122.5	105.2	95.9	91.9	90.5
Radio and TV receiving equipment	365	(T)	(T)	(S)	1.8	1.2	1.3	1.5	0.8	1.0	1.0	1.0
Communication equipment	366	48.8	59.3	62.2	65.0	71.9	73.1	58.0	47.1	35.8	31.2	(S)
Electronic components	367	25.6	(T)	29.2	(S)	43.7	44.3	42.8	(S)	32.6	28.4	29.5
Other electrical equipment	361-64,369	(T)	18.4	17.9	16.5	13.6	(S)	(S)	21.3	(S)	31.2	29.1
Transportation equipment	37	134.3	(T)	160.3	179.2	187.3	188.2	185.4	170.2	149.7	141.1	144.7
Motor vehicles and motor vehicles equipment	371	29.0	28.6	28.7	33.9	46.5	47.3	45.8	49.4	45.3	44.5	45.2
Other transportation equipment	373-75,379	2.2	(T)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)
Aircraft and missiles	372,376	103.1	111.5	130.2	144.8	136.3	136.4	134.8	115.3	100.2	92.9	95.0

(continued)

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Table B–32.

Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry and size of company: 1983–93

(page 2 of 2)

Industry and size of company	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
		Thousands										
Professional and scientific instruments	38	(T)	(T)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)
Scientific and mechanical measuring instruments	381-82	(T)	(T)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)
Optical, surgical, photographic, and other instruments	384-87	(T)	(T)	19.8	24.0	24.6	24.9	14.5	8.1	(S)	(S)	21.0
Other manufacturing industries[1]	27,31,39	5.9	(T)	(S)	(S)	6.3	6.4	5.4	5.6	(S)	6.0	5.9
Nonmanufacturing industries	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-85, 87, 89	31.2	49.8	66.8	75.1	96.4	101.9	125.2	(S)	(S)	202.6	211.0
		Distribution by size of company [Based on number of employees]										
Total (January)		540.9	584.1	622.5	671.0	695.8	708.6	722.5	743.6	773.4	779.3	787.1
Fewer than 500[2]		52.7	81.9	78.3	(S)	105.2	109.0	105.4	(S)	(S)	142.1	140.3
500 to 999[3]		N/A	N/A	16.5	(S)	18.4	19.3	18.0	18.6	18.6	46.2	48.5
1,000 to 4,999		48.3	52.6	61.6	66.7	76.4	81.9	76.1	75.4	79.3	94.2	102.6
5,000 to 9,999		29.8	30.1	28.5	38.9	40.5	40.2	47.3	57.2	55.1	57.6	58.7
10,000 to 24,999		84.3	84.0	89.9	88.4	92.0	94.5	87.0	73.9	90.3	99.9	103.8
25,000 or more		325.8	335.5	347.6	365.3	363.3	363.7	388.7	404.2	408.4	339.3	333.2

[1] Until 1984, tobacco products (SIC 21) was included with Other manufacturing industries.

[2] Data for 1982-83 are for companies with fewer than 1,000 employees.

[3] Until 1984, data were not broken down into this level of detail. See Fewer than 500, above.

KEY: (S) = Data have been withheld because of imputation of more than 50 percent.
(T) = Data not separately available, but are included in total.
N/A = Not available

NOTE: As a result of a new sample design, statistics for 1988-92 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See Appendix A for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

Table B–33.

Cost per R&D scientist or engineer, by industry and size of company: 1982–92

(page 1 of 2)

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
		Dollars										
Total		111,600	116,000	124,000	130,200	128,500	128,800	132,300	134,500	141,300	148,600	154,900
		Distribution by industry										
Food, kindred, and tobacco products[1]	20,21	(D)	(D)	(D)	(D)	(D)	(S)	(D)	(D)	(D)	130,000	143,500
Textiles and apparel	22,23	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	94,100
Lumber, wood products, and furniture	24,25	(S)	(S)	115,400	116,300	(S)	(S)	(D)	(D)	(D)	(D)	137,300
Paper and allied products	26	70,800	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	116,100
Chemicals and allied products	28	102,500	104,800	112,500	116,300	117,100	125,000	139,400	149,000	159,000	167,600	191,300
Industrial chemicals	281-82,286	122,100	123,100	132,000	144,600	150,200	(S)	(S)	(S)	(S)	181,000	181,600
Drugs and medicines	283	(D)	103,100	(D)	(D)	113,600	(D)	(D)	(D)	(D)	(D)	217,400
Other chemicals	284-85,287-89	(D)	(D)	(D)	(D)	83,100	(D)	(D)	(D)	(D)	(D)	145,700
Petroleum refining and extraction	13,29	(D)	(D)	(D)	(D)	(D)	187,400	182,700	194,000	201,800	217,000	203,300
Rubber products	30	(D)	75,400	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	89,800
Stone, clay, and glass products	32	(D)	(D)	(D)	(D)	118,000	122,500	(D)	(D)	(D)	(D)	111,100
Primary metals	33	118,200	129,900	(D)	(D)	(D)	131,500	118,600	(S)	(D)	142,200	110,600
Ferrous metals and products	331-32,3398-99	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	136,400
Nonferrous metals and products	333-36	(D)	(D)	112,000	136,400	138,800	(D)	(D)	(D)	(D)	(D)	(S)
Fabricated metal products	34	(S)	(S)	111,600	112,900	(S)	76,600	88,100	(S)	(S)	115,500	125,400
Machinery	35	103,800	108,400	124,500	142,500	(D)	(D)	(D)	130,000	138,500	147,800	152,300
Office, computing, and accounting machines	357	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	172,900
Other machinery, except electrical	351-56,358-59	(D)	(D)	(D)	(D)	119,200	98,300	(D)	(D)	(D)	(D)	110,300
Electrical equipment	36	100,000	114,300	121,700	124,900	120,700	124,300	124,100	132,400	142,800	147,100	148,600
Radio and TV receiving equipment	365	(D)	105,300	(D)	(D)	88,700	97,900	(D)	(D)	(D)	(D)	94,400
Communication equipment	366	123,300	135,000	143,000	147,800	141,300	155,300	160,300	170,600	177,100	(S)	(S)
Electronic components	367	69,600	(S)	100,500	114,100	(D)	98,400	(D)	(D)	(D)	(D)	126,900
Other electrical equipment	361-64,369	(D)	(D)	(D)	(D)	(D)	(S)	(D)	(D)	(D)	(D)	158,600
Transportation equipment	37	(D)	(D)	(D)	(D)	170,700	183,400	195,600	211,700	215,700	189,400	185,300
Motor vehicles and motor vehicles equipment	371	162,600	184,700	211,400	223,100	(D)	(D)	(D)	(D)	(D)	(D)	222,400
Other transportation equipment	373-75,379	(D)	114,200	(D)	(D)	(S)	(S)	(D)	(D)	(D)	(D)	(S)
Aircraft and missiles	372,376	148,800	143,600	156,000	161,700	149,800	180,400	193,300	207,300	213,700	177,000	171,600

(continued)

Table B–33.

Cost per R&D scientist or engineer, by industry and size of company: 1982–92

(page 2 of 2)

Industry and size of company	SIC code	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
		Dollars										
Professional and scientific instruments	38	(S)	(S)	116,900	122,000	(S)	(S)	(S)	(S)	(S)	(S)	(S)
Scientific and mechanical measuring instruments	381-82	(D)	83,200	(D)	(D)	(D)	(D)	(S)	(S)	(S)	(S)	(S)
Optical, surgical, photographic, and other instruments	384-87	(D)	141,100	(D)	(D)	(D)	(D)	316,700	(S)	(S)	(S)	(S)
Other manufacturing industries[1]	27,31,39	(D)	98,500	(D)	(D)	(S)	(D)	(D)	(D)	(D)	(D)	109,900
Nonmanufacturing industries	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-85, 87, 89	84,800	82,400	84,100	94,600	86,800	69,100	74,900	(S)	(S)	137,400	145,600
		Distribution by size of company [Based on number of employees]										
Fewer than 500[2]		62,800	65,700	55,000	(S)	70,600	66,800	67,100	66,200	(S)	103,400	102,600
500 to 999[3]		N/A	N/A	87,200	(S)	103,400	92,600	(S)	98,200	(S)	178,700	176,100
1,000 to 4,999		84,800	82,800	96,700	97,300	106,400	91,900	100,600	101,900	91,400	119,400	125,600
5,000 to 9,999		82,900	93,400	111,000	119,300	108,400	102,900	100,400	102,500	110,800	150,800	148,400
10,000 to 24,999		98,500	112,900	130,500	124,600	122,300	132,700	143,000	127,300	135,300	167,300	163,800
25,000 or more		128,900	134,200	143,000	155,300	154,300	157,700	160,700	168,200	193,700	180,100	181,000

[1] Until 1984, tobacco products (SIC 21) was included with Other manufacturing industries.

[2] Data for 1982-83 are for companies with fewer than 1,000 employees.

[3] Until 1984, data were not broken down into this level of detail. See Fewer than 500, above.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.
N/A = Not available

NOTES: The number of full-time-equivalent R&D scientists and engineers used to estimate the cost per R&D scientist or engineer is the arithmetic mean of the numbers of R&D scientists and engineers reported for January in two consecutive years. This number is then divided into the total R&D expenditures of the earlier years, and the ratio is attributed to the earlier year. As a result of a new sample design, statistics for 1988–92 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See Appendix A for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1992

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Table B–34.

R&D expenditures at universities and colleges, by source of funds and science and engineering field: fiscal years 1985–92

Source and field	1985	1986	1987	1988	1989	1990	1991	1992
	Thousands of dollars							
Total	9,686,420	10,926,948	12,151,935	13,462,796	15,019,003	16,334,400	17,637,627	18,879,705
Source of funds:								
Federal Government	6,063,176	6,710,320	7,341,570	8,191,521	8,996,808	9,637,485	10,226,104	11,087,032
State and local governments	752,146	915,135	1,023,430	1,106,428	1,234,140	1,338,598	1,484,443	1,505,515
Industry	560,027	699,759	790,161	871,960	998,431	1,130,397	1,209,909	1,302,018
Institutional funds	1,617,054	1,869,009	2,168,527	2,356,682	2,713,905	3,032,736	3,404,366	3,576,407
All other sources	694,017	732,725	828,247	936,205	1,075,719	1,195,185	1,312,806	1,408,732
Field:								
Engineering, total	1,417,876	1,640,734	1,891,744	2,096,154	2,397,709	2,663,146	2,907,412	3,082,262
Aeronautical and astronautical	80,525	94,422	108,150	122,814	145,077	159,320	176,121	191,647
Chemical	116,210	132,260	148,362	162,559	194,060	218,612	243,960	262,195
Civil	153,156	177,984	190,680	224,966	246,212	284,900	316,879	340,636
Electrical	337,403	394,869	450,836	509,143	600,013	667,491	683,014	711,746
Mechanical	207,751	227,987	274,873	303,469	343,781	392,251	422,613	456,124
Metallurgical and materials[1]	—	—	—	—	—	273,671	306,256	294,297
Other	522,831	613,212	718,843	773,203	868,566	666,901	758,570	825,618
All sciences, total	8,268,544	9,286,214	10,260,191	11,366,642	12,621,294	13,671,254	14,730,215	15,797,443
Physical sciences	1,148,141	1,286,424	1,397,878	1,553,736	1,648,912	1,809,339	1,945,057	2,057,842
Astronomy	96,083	101,795	108,429	126,764	136,590	169,594	208,947	231,945
Chemistry	421,212	469,385	513,145	564,841	609,534	650,926	670,963	701,216
Physics	551,053	630,586	673,461	739,661	784,509	841,805	871,832	915,347
Other	79,793	84,658	102,843	122,470	118,278	147,014	193,315	209,335
Environmental sciences	705,279	775,948	838,860	893,886	1,014,205	1,079,930	1,129,861	1,248,800
Atmospheric	107,534	119,948	131,649	137,553	170,246	178,066	180,151	193,887
Earth sciences	253,797	274,390	283,898	294,204	322,356	355,453	384,833	414,270
Oceanography	257,973	279,992	299,949	333,282	365,382	383,942	396,788	437,406
Other	85,975	101,618	123,364	128,847	156,220	162,469	168,089	203,236
Mathematical sciences	127,730	151,561	177,246	198,848	214,000	221,026	230,178	247,092
Computer sciences	280,756	321,316	372,411	408,509	472,190	513,838	553,593	555,572
Life sciences	5,278,815	5,890,275	6,528,085	7,257,011	8,081,805	8,748,152	9,495,977	10,227,816
Agricultural sciences	999,299	1,089,380	1,120,746	1,176,379	1,286,046	1,352,186	1,460,734	1,511,943
Biological sciences	1,780,387	1,945,542	2,143,136	2,398,627	2,640,787	2,856,816	3,055,107	3,318,933
Medical sciences	2,318,369	2,615,676	3,000,424	3,377,752	3,827,561	4,168,510	4,569,715	4,967,380
Other	180,760	239,677	263,779	304,253	327,410	370,640	410,422	429,560
Psychology	158,176	170,200	187,285	212,971	236,791	258,076	290,745	336,107
Social sciences	383,320	462,456	502,254	552,212	636,933	706,309	755,146	817,209
Economics	118,060	135,712	149,375	163,009	188,076	201,763	211,007	224,660
Political science	59,379	68,679	80,987	86,660	103,381	115,595	125,173	143,642
Sociology	75,489	96,877	96,668	109,491	121,798	134,096	157,957	165,631
Other	130,392	161,188	175,224	193,052	223,678	254,854	261,008	283,275
Other sciences	186,327	228,034	256,172	289,469	316,459	334,586	329,659	307,006

[1] Data for metallurgical and materials engineering were not collected separately prior to fiscal year 1990.

SOURCE: National Science Foundation/SRS, Survey of Scientific and Engineering Expenditures at Universities and Colleges, Fiscal Year 1992

Table B–35.
Federally financed R&D expenditures at universities and colleges, by science and engineering field: fiscal years 1985–92

Source and field	1985	1986	1987	1988	1989	1990	1991	1992
	Thousands of dollars							
Total	6,063,176	6,710,320	7,341,570	8,191,521	8,996,808	9,637,485	10,226,104	11,087,032
Engineering, total	867,105	977,562	1,112,647	1,229,742	1,383,131	1,524,205	1,634,901	1,754,667
Aeronautical and astronautical	61,519	72,671	80,168	93,681	111,737	122,968	133,483	146,129
Chemical	64,619	73,284	76,652	85,506	101,187	110,630	117,602	126,462
Civil	78,834	88,360	89,699	103,135	101,664	115,939	122,751	143,982
Electrical	228,549	260,340	292,216	330,387	389,775	435,126	438,440	455,172
Mechanical	134,131	148,001	178,483	192,612	213,854	238,723	252,044	272,173
Metallurgical and materials[1]	—	—	—	—	—	139,204	154,088	142,457
Other	299,453	334,906	395,429	424,421	464,913	361,616	416,493	468,293
All sciences, total	5,196,071	5,732,758	6,228,923	6,961,779	7,613,677	8,113,280	8,591,203	9,332,366
Physical sciences	889,820	982,058	1,051,029	1,157,449	1,197,148	1,313,785	1,382,611	1,476,443
Astronomy	64,393	69,686	71,189	83,744	87,438	112,157	134,204	152,651
Chemistry	312,615	338,112	367,823	402,674	422,609	444,899	447,306	476,266
Physics	452,937	510,114	534,797	579,590	605,146	651,363	667,930	701,423
Other	59,875	64,146	77,220	91,441	81,955	105,365	133,172	146,104
Environmental sciences	473,980	516,762	545,662	589,113	660,752	690,832	707,844	799,184
Atmospheric	85,872	97,469	108,047	111,803	133,825	135,943	134,604	146,762
Earth sciences	154,071	160,108	159,523	174,522	186,079	204,420	216,460	236,012
Oceanography	187,666	208,063	217,702	238,508	265,942	267,633	267,810	310,864
Other	46,371	51,122	60,390	64,280	74,906	82,836	88,970	105,545
Mathematical sciences	96,979	114,359	131,952	149,959	156,459	159,580	170,064	182,725
Computer sciences	195,665	232,604	257,263	289,129	322,480	340,053	369,082	377,434
Life sciences	3,188,063	3,492,655	3,835,833	4,325,594	4,782,507	5,077,083	5,407,076	5,892,771
Agricultural sciences	294,083	292,465	297,676	322,571	348,563	351,888	375,403	413,437
Biological sciences	1,208,901	1,311,089	1,418,657	1,602,813	1,734,863	1,841,903	1,944,089	2,139,584
Medical sciences	1,576,544	1,742,129	1,961,800	2,212,997	2,501,033	2,665,223	2,842,512	3,088,901
Other	108,535	146,972	157,700	187,213	198,049	218,069	245,072	250,849
Psychology	105,904	114,001	123,830	140,358	155,802	168,320	192,059	221,641
Social sciences	153,806	172,867	168,697	188,988	211,776	225,720	251,528	278,430
Economics	43,711	45,448	43,425	49,171	54,217	54,198	59,651	66,126
Political science	19,669	20,172	24,035	25,163	25,572	25,143	28,287	35,813
Sociology	40,480	49,760	44,817	48,430	53,729	59,637	72,060	82,377
Other	49,946	57,487	56,420	66,224	78,257	86,741	91,529	94,114
Other sciences	91,854	107,452	114,657	121,189	126,752	137,908	110,939	103,738

[1] Data for metallurgical and materials engineering were not collected separately prior to fiscal year 1990.

SOURCE: National Science Foundation/SRS, Survey of Scientific and Engineering Expenditures at Universities and Colleges, Fiscal Year 1992

Table B–36.

R&D expenditures at university-administered federally funded research and development centers, by science and engineering field: fiscal years 1985–92

Field	1985	1986	1987	1988	1989	1990	1991	1992
	Thousands of dollars							
Total	3,523,092	3,894,806	4,206,084	4,530,562	4,729,612	4,831,971	5,078,544	5,248,676
Engineering, total	1,296,043	1,445,252	1,547,061	1,614,250	1,642,799	1,708,134	1,788,565	1,797,173
Aeronautical and astronautical	107,065	126,566	132,238	146,894	145,035	143,643	156,265	177,852
Chemical	40,082	40,048	41,884	43,964	40,162	40,754	43,356	74,889
Civil	15,597	16,014	17,568	17,500	16,439	15,083	16,109	33,635
Electrical	454,233	514,263	550,430	555,635	568,626	604,894	613,344	592,891
Mechanical	489,469	540,103	570,698	602,857	628,057	627,262	646,379	545,245
Metallurgical and materials[1]	—	—	—	—	—	3,481	25,833	54,926
Other	189,597	208,258	234,243	247,400	244,480	273,017	287,279	317,735
All sciences, total	2,227,049	2,449,554	2,659,023	2,916,312	3,086,813	3,123,837	3,289,979	3,451,503
Physical sciences	1,448,808	1,540,627	1,660,404	1,717,181	1,828,314	1,824,648	1,917,223	2,017,123
Astronomy	73,330	79,047	82,360	117,658	112,493	112,239	121,353	143,448
Chemistry	226,440	246,911	261,267	274,647	274,359	261,048	251,787	268,092
Physics	1,097,949	1,159,738	1,257,808	1,263,616	1,378,015	1,382,608	1,460,765	1,499,740
Other	51,089	54,931	58,969	61,260	63,447	68,753	83,318	105,843
Environmental sciences	200,074	232,606	257,800	289,352	298,529	292,045	318,874	339,434
Atmospheric	83,498	99,017	103,504	91,069	98,594	103,239	112,978	152,559
Earth sciences	46,552	50,361	76,276	80,190	65,212	64,894	71,341	79,898
Oceanography	16,056	19,489	2,032	1,764	1,916	1,664	2,226	17,117
Other	53,968	63,739	75,988	116,329	132,807	122,248	132,329	89,860
Mathematical sciences	92,858	109,102	121,793	126,084	128,664	135,374	132,222	124,313
Computer sciences	338,116	427,297	472,766	621,744	668,092	685,954	715,744	713,878
Life sciences	110,905	107,506	115,416	123,508	130,556	142,394	145,531	191,166
Agricultural sciences	633	663	684	1,397	1,175	1,017	1,041	1,153
Biological sciences	82,057	85,195	87,202	91,712	101,287	112,559	115,145	139,047
Medical sciences	10,729	8,572	10,570	12,996	10,114	10,345	11,355	16,250
Other	17,486	13,076	16,960	17,403	17,980	18,473	17,990	34,716
Psychology	264	294	899	973	947	1,010	1,075	945
Social sciences	17,591	19,343	21,421	27,868	23,291	29,744	33,935	21,417
Economics	4,401	4,043	2,554	1,477	491	632	741	613
Political science	4,038	4,994	4,563	5,843	3,858	6,459	7,610	5,055
Sociology	0	0	0	0	0	0	0	0
Other	9,152	10,306	14,304	20,548	18,942	22,653	25,584	15,749
Other sciences	18,433	12,779	8,524	9,602	8,420	12,668	25,375	43,227

[1] Data for metallurgical and materials engineering were not collected separately prior to fiscal year 1990.

SOURCE: National Science Foundation/SRS, Survey of Scientific and Engineering Expenditures at Universities and Colleges, Fiscal Year 1992

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